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WHOLE LIFE HEALTH INSURANCE

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ABBREVIATION GLOSSARY

ADSE - Social insurance scheme for public sector workers and civil servants
CEA – European Committee of Insurers
CIRS – Código do Imposto sobre os Rendimentos de Pessoas Singulares
GDP- Gross Domestic Product
GHD –Global Health Department
IGIF- Health Financial and Computer Management Agency
INE – National Statistical Institute
INSA - National Institute of Health
NHS – National Health Service
OECD – Organization for Economic Co-Operation and Development
PAI - Portuguese Association of Insurers
PNS – National Health Plan
SAMS **-** Health subsystem for employees of the banking sector

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ABSTRACT

The health insurance has become complementary to the National Health Care system in Portugal. In the last years, the increase of this insurance has been considerable. Despite the health concerns of Portuguese citizens, related to better life quality, medical technology and others, the ageing of Portuguese population is a reality to be well thought-out. Regarding this fact, the whole life health insurance is an important product to be developed.

In this dissertation, it is presented an approach to the calculation of the level premiums for the whole life health insurance in order to fulfil the Portuguese insurer's market requests. A private health insurance company with a historical data of ten years provided the statistics used for this calculation. The levelled insurance premiums were calculated on the basis of the risk involved and according to the principle of equivalence. This means that regarding the period insured, the total of premiums should match the total of the benefits.

Key words: Health, Private Health Insurance, Level Premium, Whole Life

JEL classification: C02, I11, I18, I19, G22, H51

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INTRODUTION

Health is a valuable item, which everyone is concerned about. The Portuguese health scheme has three parallel health care systems; one of them is the private health insurance.

The Private health insurance begins its commercialization in Portugal in the year 1982, and it is a market in truly development. More than twenty two per cent[1] of the resident Portuguese population over fifteen years old are covered by a health insurance. Individuals, families and companies search for the health insurance in order to get more quality, efficiency and easy access to the health care provide.

Concerning the volume of written premiums, the health business presents the highest increase, eight per cent (2007/2006)[2], far above the other non-life lines of business, which reveals the dynamism of this business line. The total health spending accounted for ten per cent of the Gross Domestic Product in Portugal in the year 2006.

Besides being a market with a rapid growing, many improvements have been done in the health insurance, in order to fulfil the insured person's needs.

For Health insurers the target question is: How ageing is contributing to immediate measures in terms of insurance? The whole life health insurance is a target to achieve since the population ageing is a reality nowadays and for the future years.

The main propose of this dissertation is to provide and approach for a method of calculation to whole life health insurance level premiums, with Portuguese data and risk profiles.

As population is getting older, the new data available, has allowed sticking together the information needed to complete the calculations with a reasonable credibility level.

The whole life health insurance (with no limit of age) already exists in some European countries. In this study, it will be presented some figures about Germany

[1] *Basef Seguros study, Marktest*, Junho 2008

[2] Portuguese Association of Insurers, *Relatório de Mercado 2007*

and France health systems, in which countries the whole life health insurances subsist.

As an actuary who worked in a health insurance company, the study of this subject was motivated due to the fact that is the crucial moment to develop insurances with the capacity to cover something as precious as health, with no age limits.

This subject matter is important to Portuguese society because there is gap in this segment concerning the age limits imposed by the actual health insurers.

The present study is structured in four chapters. Following the introduction, the first chapter presents a global perspective of the Health Care System, with the description of Portuguese figures and also an overview of the Germany and French health care systems.
The second chapter is with reference to the whole life health insurance; it describes the scope and approach to the data collection that has been carried out as part of this study and a suggestion of methodology approach for the level premiums calculation.
The results of the application of the methodology are presented in the third chapter and also some sensitivity analysis to the outcomes obtained.
The last part, presents the conclusions and recommendations that should be kept in mind in reviewing this study.

1. HEALTH SYSTEM

1.1 PORTUGUESE HEALTH SYSTEM

1.1.1 HEALTH CARE CONTEXT

The Portuguese Republic Constitution establishes that the right to health protection is realised "through a national health service, universal and global, which, regarding the economic and social conditions of citizens, is free" [paragraph *a)* of n.º 2 of article 64.º from Portuguese Republic Constitution].

The Portuguese health care system is characterized by three parallel, overlapping systems:

I. The National Health Service (*NHS*);
II. Special public and private health insurance programmes associated with occupational schemes in accumulation to the *NHS* (health subsystems);
III. Private voluntary health insurance schemes.

I. The National Health Service is the major structure that composes the Portuguese health system. *NHS* was created in 1979 with the purpose of establishing a nationwide network of public hospitals and health care centers, providing primary health care access for all Portuguese population. This system covers medical treatment and subsidises an extensive variety of medication.
   It is financed mainly through taxation, "for certain health care services delivered by *NHS* facilities the patient pays a certain fixed amount per use. For pharmaceutical products, a coinsurance scheme exists, for which the patient pays a certain fixed proportion of the cost of the pharmaceutical" (Pita and Simões, 2007).

   Actually, in the *NHS* there are three co-existing management systems:
   - Public administrative management of health synchronized with private-public, which is the most common;

- Private management and exploration with profit finality of equipments and accommodations that have been acquired with public funds or medical services paid by the State budget;
- Economic management of health, which is in strong development.

II. Another structure is the special health insurance programmes associated with occupational schemes (health subsystems) in accumulation to the *NHS*. The principal one is the *ADSE*, a scheme accessible to civil servants and their dependents. It covers almost 10% of the population, which corresponds to 1.36 million enrolled beneficiaries. (Pita and Simões, 2007)

A further important scheme is the one for Bank workers named *SAMS (*Union of Bank Employees of North, Centre and South Regions and the Islands Medical Assistance Services*)*. Many others as the one for military personnel, postal workers, insurance company's employees and Ministry of Justice are also special health insurance programmes.

The advantage of these schemes is that they supply a higher quality, and allow to choice health providers.

III. The last structure is the private health insurance schemes, which have begin in 1982 , and in 2008, 1,9 million Portuguese persons with age over 15 years are insured[3].

The private sector has increased significantly; it is becoming complementary to the *NHS*.

Regarding these schemes, citizens can choose between the *NHS* and the private health insurances or can even enjoy the usufruct of both. In accumulation to both of these schemes, part of these citizens is covered by a health subsystem.

In addition to the health coverage provided by the *NHS*, approximately twenty five per cent of the population is covered by a health subsystem or private health insurance. In particular, around sixteen per cent of the population is covered by a health subsystem; approximately twenty two per cent are covered by private health insurance and less than two per cent have cumulative coverage from both private health insurances and health subsystems. (*INSA* 2007)

[3] *Basef Seguros* study, *Marktest, June 2008*

In the last recent years the Portuguese public health system has suffered changes in order to improve performance.

As mentioned by Pita and Simões (2007), the measures made since 2002 have included: public–private partnerships (PPPs) for new hospitals; a change in *NHS* hospital management rules towards a more entrepreneurial approach and a more effective purchaser–provider split; promoting generic substitution of pharmaceuticals; liberalization of prices and entry into the Over-The-Counter (OTC) market; administrative price reductions for pharmaceutical products; introduction of a reference pricing mechanism for pharmaceuticals facing competition from generics; regular updates of the co-payments for public health care services; reorganization of the public network of services (closure of delivery rooms in some hospitals, reshuffling of emergency departments, mergers of hospital management teams); definition of a national health plan and creation of long-term care networks.

Following the restructuration of the *NHS*, there has been a conversion process of hospitals into enterprises with public money that is still in route. This process leads to a new juridical statute and to a hospital management similar to the one of the private hospitals. (Banco de Portugal, *Relatório anual 2007*)

According to the health Secretary of State, mentioned in the parliament (2008), the next priority will be the creation of Family Health Units (USFs, *Unidades de Saúde Familiar*). This will extinguish the health sub-regions, in order to complete the reform of health primary care with the purpose of getting close to the population, giving more resources and autonomy.

A new network of integrated continuous care is being created between the public, social and private sector.

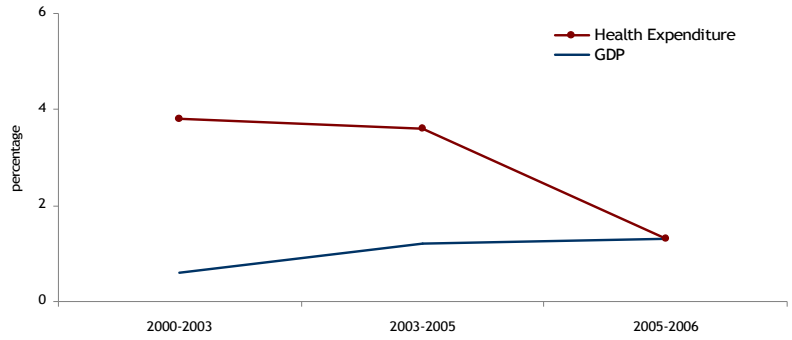
In the hospital network, there was an improvement regarding the lists for surgery, the requalification of maternities and emergencies and also the incentive to ambulatory surgery.

Another current change was the beginning of *Saúde 24* as a public center responsible for all health telephonic advisers and the widening of operational means of *INEM* (Instituto Nacional de Emergência Médica, IP)

Portuguese government is making an effort in order to invest in new hospital accommodations and/or make modern some of the existing ones. As mentioned by the health Secretary of State (Parliament 2008), the *NHS* hospitals are getting more efficient. He also mentioned that in 2008 the *NHS* is bigger and better, providing more services, more primary care visits or speciality visits. However, the improving in the *NHS* quality and the financing is still a concern.

Between 2004 and 2007, the transfers from State budget to *NHS* increased only 2,2%, and for the same period, the GDP raised 10,7%, this means that the relation between health expenses and GDP has decreased from 5,2% to 4,8% of GDP.

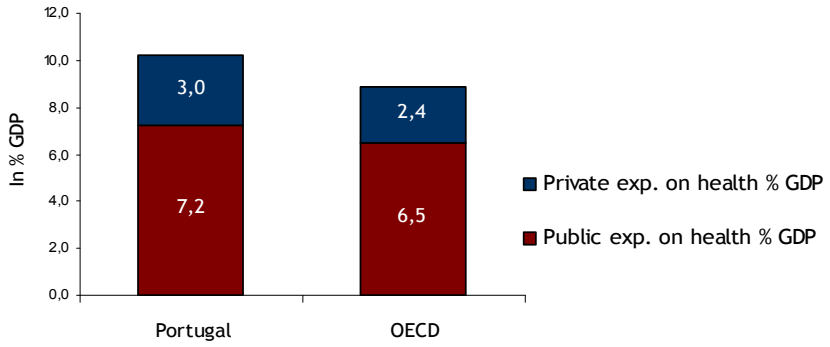
Figure 1.1 - Real Annual Growth Rates in Health Expenditure and GDP, 2000 to 2006



Source: *OECD* HEALTH DATA 2008, June 08

According to the *OECD Annual Report 2007*, healthcare expenditure accounted for about 4% of the GDP when the *OECD* was funded in 1960; but the average across OECD countries is now 9%, and it is above 11% in several of the large economies.

Figure 1.2 - Health Expenditure as share of GDP, 2006



Source: *OECD* HEALTH DATA 2008, June 08

Public expenditure is clearly dominating representing 7.2% of the GDP in Portugal.

Total health spending in Portugal accounted for 10.2% of GDP in 2006 (*OECD* Health Data 2008 - Version: June 2008), higher than the average of 8.9% across *OECD* countries.

Health spending per capita in Portugal grew, in real terms, by an average of 3.3% per year between 2000 and 2006, below the *OECD* average of 5% per year (Relatório Primavera 2007). Despite spending a high proportion of its GDP on health, Portugal spent only 2,120 USD on health per capita in 2006, a lower figure than the *OECD* average of 2,824 USD.

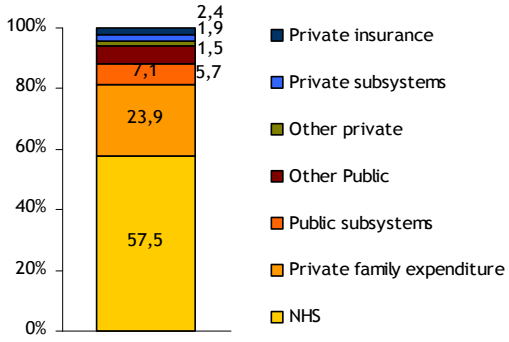
Table 1.1 - Health spending per capita (USD)

	2000	2001	2002	2003	2004	2005	2006
Health spending per capita	1509	1569	1657	1824	1913	2029	2120
Variation	13,5%	4,0%	5,6%	10,1%	4,9%	6,1%	4,5%

Source: *OECD* HEALTH DATA 2008, June 08

In Portugal the state contribution in the total health expenditure is lower than the average of *OECD* countries. In percentage terms, the state contribution for each Portuguese citizen is 71,9%, lesser than the average of *OECD* which has a percentage of 80,4%.

Figure 1.3 - Structure of total Health Expenditure by financing, 2006



Soure: *INE - Conta satélite da Saúde*, 2005-2007

Public financing is overpowered, in 2006; the *NHS* was responsible for around 58% of the total health expense. The public subsystems financed 7% of total expense. The family's expense was financed around 24% and other private agents like other societies, nonprofits institutions at families service, private health subsystems and the private health insurances, financed, all together 6%. The expression of Private health insurances is still slight with only 2,4% of total expense.

It is well known that health expenses in Portugal, vis-à-vis the produced wealth are getting higher. The increase of the health expenses is mostly due to the increase of the rhythm of public health expenses. (Pita, 2007a)

PUBLIC HEALTH MANAGEMENT

The public sector continues to be the main source of health funding in all *OECD* countries, except the United States and Mexico. In Portugal, 71% of health spending was funded by public sources in 2006, slightly below the *OECD* average of 73%.
According to the *Conta Satélite da Saúde em Portugal*, *Nota Mensal de Conjuntura-Abril* 2006, in Portugal, as occurs in the other *OECD* countries, there was an increase of public health expenditure when comparing to GDP. The European Union projections indicate the maintenance of this scenario for the period of 2004-2050 due to the ageing of population.

In terms of projection of future public health expenses, the *OECD* presented the following projections to 2050.

Table 1.2 – *OECD* Projections on Public expenses in GDP percentage

(%GDP)	Public expenditure with health primary care			Public expenditure with health continuous care			Total		
	2005	2050		2005	2050		2005	2050	
		cost-pressure	cost-containment		cost-pressure	cost-containment		cost-pressure	cost-containment
Portugal	6.7	10.9	9.1	0.2	2.2	1.3	6.9	13.1	10.4
OECD average	5.7	9.6	7.7	1.1	3.3	2.4	6.7	12.8	10.1

Source: *OECD*, 2006,p31

These projections of public expenses considered two scenarios, cost-pressure where containment measures are not considered in public costs, and cost-containment, where it is considered that governments have made some non specified containment. In this last scenario, which is more realistic, it is likely that between 2005 and 2050, public expenses with health primary care will increase 2,4p.p. of Portuguese GDP and 2p.p. in the *OECD* average.

OECD expects that the total public health expenses will raise 3,5 p.p. in Portugal. If government will implement no containments measures, the financial sustainability of health systems would be a problem.

According to the *Relatório anual 2007 Banco de Portugal*, beneath the reform of the Portuguese *NHS*, which began in 2002, there has been a gradual transformation of Hospitals into enterprises of public capitals. This change implies a new juridical status and a hospital management in close proximity to the private sector. On the opposite of the past years, where hospitals received a global transfer from the State Budget, nowadays, these enterprise-hospitals have a pre-defined quantity of health services hired by year. The financing of these new hospitals is now done with a government payment for each medical act.

In terms of national budget, the enterprise-hospitals are no longer part of the public administration sector being part of the institutional sector of non-financial enterprises.

Table 1.3 – Public administration expenses related to Enterprises-Hospitals

	2002	2003	2004	2005	2006	2007
Amount included in the public administration expenses concerning enterprises-hospitals	2.1	0.9	0.9	0.9	0.5	0.1
Expenses with employees	1.2	0.5	0.5	0.5	0.3	0.1
Intermediate Consumption	0.8	0.4	0.4	0.4	0.2	0.0
Payments to the services of enterprises – hospitals between 2002 and 2007	-	1.1	1.0	1.1	1.4	1.8

Source: Calculations from Bank of Portugal

Table 1.3 illustrates the expenses related to enterprise-hospitals in the perspective of the impact in the public administration account.
In the period of time before the process of "enterprise" (occurred in 2001), the expenses associated with the set of enterprise–hospitals between 2002 and 2007, which were included in the public administration accounts, achieved around 2.1 percent of GDP mostly due to expenses with employees.

In the end of 2002, when public administration left the first set of hospitals, it was verified an expressive decrease of expenses, around 1.2 p.p. from GDP.
With the evolution of the "enterprise" process, there was a gradual decrease with the GDP ratios in expenses with employees and intermediate consumption. In 2007, the process of "enterprise" occurred during the year, as a consequence, the values for expenses with employees and intermediate consumption, are not expressive.

Table 1.4 – Public administration expenses in Health (Evolution)

	2003[1]	2004[1]	2005[1]	2006[1]	2007[2]
Public Health Expenses (10^6 euros)	9.265,7	9.812,6	10.297,5	10.510,4	10.660,6
Public expend. on health as % of total expenditure on health	72,8	71,7	71,4	71,2	69,8
Nominal Variation rate (%)	8,7	5,9	4,9	2,1	1,4
Variation rate in volume (%)	2,9	1,4	1,3	2,0	

1- Definitive, 2- Provisional
Source: INE, Conta Satélite Saúde 2005-2007

Table 1.5 – Public funding for the health system as percentage of GDP

	2000	2001	2002	2003	2004
National Health service	61,12	58,80	59,38	59,72	57,57
Public Subsystems	6,40	6,64	7,69	6,48	7,00
Other public funding (mainly tax benefits)	4,43	5,19	4,46	5,37	5,73
Social Security	0,96	0,90	1,00	0,99	0,86
Total Public Funding	72,91	71,53	72,53	72,58	71,17

Source: *INE*, 2006

The Portuguese public expenses in health have a significant share, for instance in 2006, the total public expenses accounted for 7,2% of GDP. To the future it is likely that the expenditure on health as a percentage of GDP will still increase.

Portuguese State makes monetary transfers to *NHS*, and also has to support other health expenses, as the expenses with the health subsystems (*ADSE*, ect.)
The *NHS* expense has benefit from the savings with the conventions and pharmacies as a consequence of an improvement in the supply practices, prices reduction and medicines reimbursement. These effects were balanced by the payments done to the enterprice-hospitals (*Relatório anual 2007*, Banco de Portugal, Finanças Públicas).

The Health care is the second sector to be studied since public spending on health amounts to a large share of GDP in most *OECD* countries, while population ageing combined with technological developments are creating strong upward pressures on future spending. (Joumard et al., 2008)
Moreover, Health care plays an important role in explaining health status changes over time and cross-country differences. Empirical work suggests that changes in health care spending, lifestyle factors (smoking behaviour, alcohol consumption and diet), education, pollution and income have been important factors behind observed increases in life expectancy and the decline of premature mortality. (*OECD* research into *Public spending efficiency*)

The most important pressing factors contributing to government expenditure on health care are:

- Medical technology

  Medical technology might be the most important factor that contributes to the expenditure on health. Nevertheless it is directly related to economic growth, so that, if the economy increases, there will be provision to invest in new technology. On the opposite, if the economic growth is reduced, there will be no investment in this area. Medical specialized procedures and different diagnosis means in ambulatory will press the health expend, by the increase of the frequency and by the raise of the claim cost associated to new techniques.

  As concluded by Caldas and Rodrigues (2003), technology and relative prices were the main drivers to the increase of spending in health care as percentage of GDP.

  According to Health at a Glance (2005), the progresses in medicine capacity to prevent, diagnose and treat are the principal factors in the increase of health costs. This proposal was also supported in *OECD* annual report 2007, where, once more, the advantages in capacity of medicine to treat and prevent health conditions were considered the major factor driving to health cost growth.

  During the past decade, there has been rapid growth in the availability of diagnostic technologies such as computed tomography (CT) scanners and magnetic resonance imaging (MRI) units in most *OECD* countries. Although Portugal has also seen some increase in such technologies, the number of MRIs in 2006 was 5.8 per million populations, well below the *OECD* average of 10.2. However, the number of CT scanners in Portugal stood at 25.8 per million populations in 2006, well above the *OECD* average of 19.2 per million populations. Although the numbers presented to Portugal are above *OECD* average, it is likely that the new technology will continue to develop and contribute to the increase of health costs.

  Recent developments in imaging, biotechnology, and pharmacology suggest that this trend is likely to continue.

- Ageing

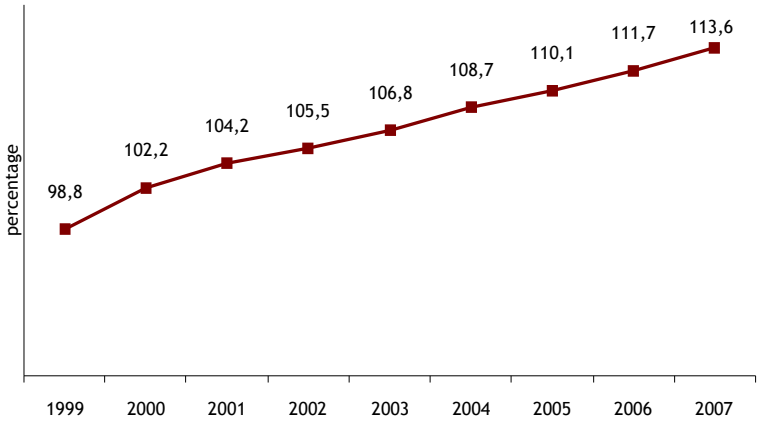
  Advances in healthcare and health systems have contributed to improvements in longevity and better health, but performance challenges still remain.

  The number and share of the population aged 65 years and older have risen in all *OECD* countries since 1960. This trend is expected to continue in future decades given the ageing of the baby-boom generation born after World War II who will start turning 65 years and older in 2010.

  In 1960 only one out of twelve people was aged 65 and over on average in *OECD* countries. By 2005, this proportion had increased to one out of seven. By 2030, more than one person in five is expected to be 65 years and older on average in *OECD* countries, and this share is expected to increase further to more than one out of four by 2050 (Lafortune et al., 2007).

  In 2007, the ageing index given by the formula: (+ 65 years/0-14 years) was 113,6% (*INE, Estimativas Anuais da População Residente*).

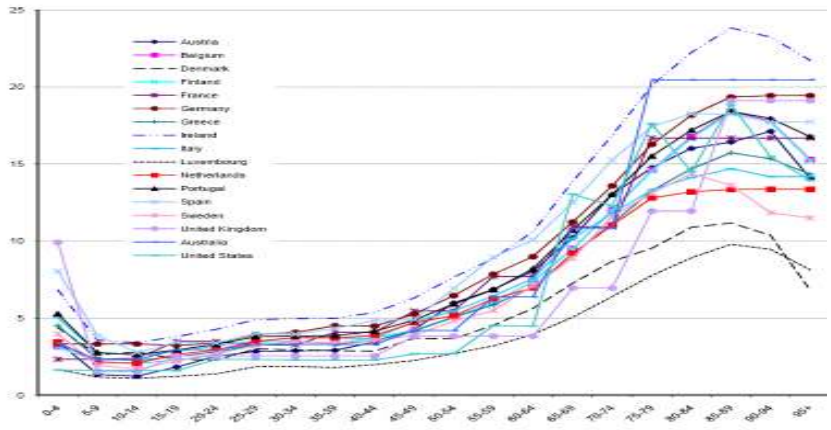
Figure 1.4 – Portuguese Ageing Index



Source: *INE, Demographic Statistics*, 2007

According to Health at a Glance, 2005, an ageing population trends to need higher health care in long-term, as a consequence, it is expected that the population ageing will increase public expenses in that area.

Figure 1.5 – Public Health Expenditure by age group (% of GDP per capita) 1)



1) Expenditure per capita in each age group divided by GDP per capita 1999; do not include expenditure on long-term care

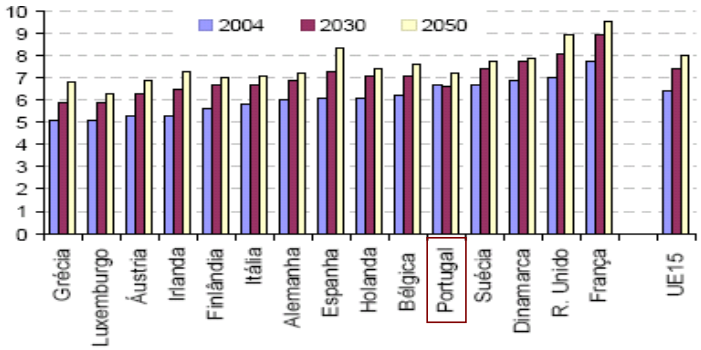
Source: Oliveira Martins and the la Maisonnnneuve (2006)

Public health care expenditure is evidently related with the age of individuals. From the sample of countries represented in the figure above, Portugal is forth with higher expenditure in the age group 0-4 years, and the sixth for ages over 89 years old.

According to Nixon and Ullman, 2006, life expectancy at older ages provides useful information as data available for the public spending component suggest that health care expenditure is often concentrated on older age groups.

As mentioned by Caldas and Rodrigues, 2003, while it is true that having more elderly around means that society has triumphed in delaying mortality; such an event will definitely strain public budgets. Even with people living longer, they may not always be in good health, as the risk of becoming seriously ill increases with age. On the other hand, even if the future elderly are healthy until the end, the unprecedented number of old people coupled with the significant costs of treating terminal illnesses are enough to warrant our concern about escalating public spending on health.

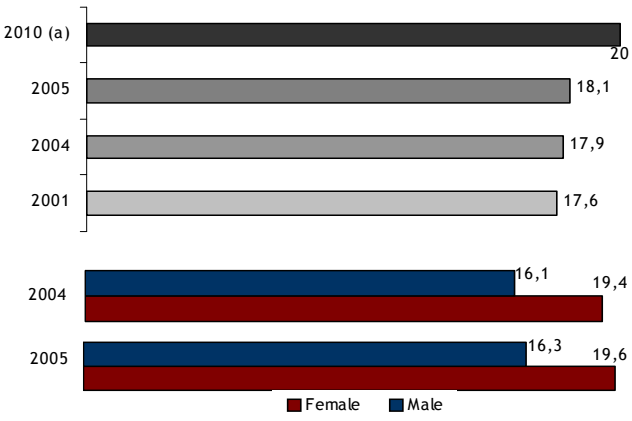
Figure 1.6 – Projection of public health expenses due to population ageing between 2004 and 2050 in *OECD* (%GDP)



Source: "The impact of ageing on public expenditure: projections for the EU25 Member States on pensions, health care, long term-care, education and unemployment transfers (2004-2050)", Comissão Europeia, Fevereiro 2006.

The Portuguese projection for 2030 mark a slightly decrease of the public expenses due to population ageing, but for 2050 it is expected an increase of public health expenses. The amount of Portuguese expenses is close to the one of UE15.

Figure 1.7 - Portuguese Life Expectancy from 65 to 69 years (years)



(a) Estimate calculated by GHD
Source: PNS 2004-2010, vol.1, pg.56
Source : INE, Demographic Statistics, 2007

The *OECD* calculations estimate that in 2040, the life expectancy at 65 will attain 21,6 years for women and 18,1 years for men. (*INE, Nuts- 2002, indicadores demográficos*)

Table 1.6 – Portugal, Number and Share of the population aged 85 and over, 1960 to 2050

	1960	1980	2000	2005	2030	2050
Number	35,637	54,487	146,395	143,797	275,378	429,377
Share	0.4%	0.6%	1.4%	1.4%	2.7%	4.6%

Source: *OECD* Demographic and Labour Force database (July 2006).

As presented in the previous table, it is expected that in 2050, the share of population over 85 will achieve 4,6%, which is a really significant value considering the expenses related with this age group.

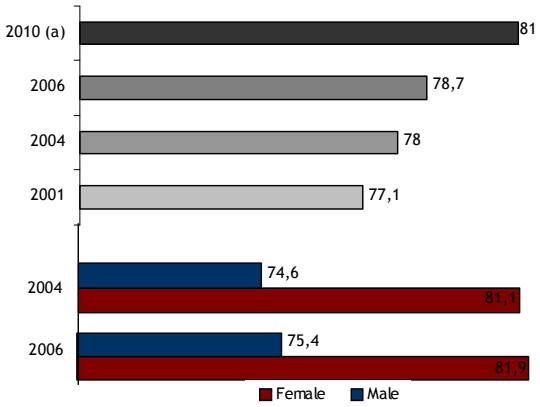
- Life Expectancy at birth

"If increase in life expectancy comes from a combination of an increase in the healthy life expectancy and an increase in time spent requiring long-term care then there would be an upward pressure on the cost." (Karlsson et al, 2004)

According to Health at a glance, 2005, life expectancy at birth has increased significantly due to better life style quality, better education level, and the access to health care and medicine efficiency. As mentioned by Nixon and Ullmann, 2006, life expectancy at birth has increased by almost ten years on average in *OECD* countries between 1960 and 2005.

In Portugal, life expectancy at birth has raised 2,1% between 2001 and 2006 from 77,1 years to 78,7 years. (Ministério da Saúde - Alto Comissariado da Saúde, 2007)

Figure 1.8 – Portuguese Life Expectancy at birth (years)



(a) Estimate calculated by GHD
Source: *PNS* 2004-2010, vol.1, pg.53
Source : *INE*, Demographic Statistics, 2007

As the figure reveal, the life expectancy is increasing along the years and it is estimated that in 2010 it will raise up to 81 years old for the Portuguese population.

- Infant Mortality

  This indicator focuses on the health care system's capacity to prevent deaths at the youngest ages, a period of life where health care spending is also relatively high. It has further been argued that infant mortality is more relevant for an efficiency analysis than LE itself, since it is less influenced by factors not related to the health care system such as education or tobacco consumption and infant mortality has been reduced by a factor of seven. (Nixon and Ullman, 2006)

  All the *OECD* countries had considerable improvements considering the reduction of infant mortality rates in the past decades. This reduction is due to the improvement of global economic and social conditions and also the improvements in the health services in the period after birth. Portugal was one of the *OECD* countries with higher infant mortality and is now one of the countries with lowest infant mortality. (Health at a Glance, 2005)

- Socio-cultural tendency

  Citizens are better informed; the demand level of the actual population is growing, as a consequence of the income increase. People search better quality and efficiency. The average level of education, allows citizens to be more conscientious in relation to health needs and as a consequence the increase of the frequency in the health care taking to an increase of the health expenditure.

  "Good health status increases with income and education and decreases with age and poor health behaviours. We find that income does have a significant protective effect for the two oldest groups, 45–64 and 65 and over. The results for education are inconsistent." (KIUILA et al., 2007)

  Education

  Higher education leads to a higher capacity, even with the same level of resources (time and health care), to attain a better health status. (Pita, 2007a)

  According to Nixon and Ullmann (2006), bbetter health is associated with higher educational investment, since healthier individuals are able to devote more time and energy to learning. Since they live longer, they also have a greater incentive to learn because they have a higher return on human capital. Moreover, education causes health if better-educated people use health care services more effectively, they tend to comply better with medical treatments, use more recent drugs and better understand discharge instructions. Nixon and Ullmann concluded that education contributes significantly to health, over and above its impact on lifestyle factors.

  Level of Income

  When comparing the level of income with education, Nixon and Ullmann state the higher correlation of income with the population health status across *OECD* countries than education. Higher GDP *per capita* affects health by facilitating access to many of the goods and services which contribute to improving health and longevity (*e.g.* food, housing, and transportation. The relation between GDP *per capita* and health may also reflect working

conditions; richer countries tend to have a higher share of service activities, which are considered to be less health damaging than others such as construction or industrial activities. The regression results are consistent with *per capita* income being a major determinant of the population health status. These results are not altered when replacing *per capita* income by the share of service employment to address causality issues (between *per capita* income and health spending) and to account for the fact that higher GDP acts on health mainly *via* better working conditions in the larger service sector.

- Pharmaceutical

  The rise in pharmaceutical spending has been one of the factors behind the increase in total health spending in many *OECD* countries due to the rapid increase of medicines expenses in the last years, more than 5% of annual increase on average since 1997. In the majority of *OECD* countries, the increase in pharmaceutical expenses has passed the increase verified in the total health expenses.

  In 2006, spending on pharmaceuticals accounted for 21.3% of total health spending in Portugal, above the *OECD* average of 17.6%. In 2008, the state expenses with products sold in pharmacies has raised 4,2% until July, this amount represents eighteen percent of the *NHS* expenses, according to General Direction of the budget.

PRIVATE HEALTH MANAGEMENT

The private financing of health expenses has several contributors like the private social insurances, private health subsystems, other privates insurances, private family expense, nonprofits institutions and other corporations.

Table 1.7 – Private administration expenses in Health (Evolution)

	2003[1]	2004[1]	2005[1]	2006[1]	2007[2]
Private Health Expenses (10^6 euros)	9.265,7	9.812,6	10.297,5	10.510,4	10.660,6
Private expend. on health as % of total expenditure on health	27,2	28,3	28,6	28,8	30,2
Nominal Variation rate (%)	7,4	11,7	6,5	3,0	8,7
Variation rate in volume (%)	1,8	6,5	3,7	0,5	

1- Definitive, 2- Provisional

Source: *INE*, *Conta Satélite Saúde* 2005-2007

According to *INE*, *Conta Satélite Saúde* 2005-2006, the largest part of the private financing is the private family expense with 80% of the total. The private health insurance, represent 8% of the private financing, and it is likely that this proportion will continue to be considerable as the health insurance market is developing, in a way that provides multiple choices regarding coverages and premiums.

Table 1.8 – Private funding for the health system as percentage of GDP

	2000	2001	2002	2003	2004
Private subsystems	1,72	1,79	1,88	2,35	2,24
Voluntary Health Insurance	1,44	1,42	1,82	2,24	2,47
Out-of-pocket payments	23,19	23,15	23,15	21,16	23,56
Other private funding	0,74	2,10	0,12	1,68	0,77
Total Private Funding	27,09	28,47	27,47	27,44	28,83

Source: *INE*, 2006

Regarding the data available, the percentage of the total private funding has been quite stable. The main contribution for the private funding is from Out-of-pocket payments, which represent 82% of this item.

The average of Family's health consume in terms of percentage of GDP is 2,8%.

The conclusion of the *Relatório de Privavera, 2008*, points out to a better quality of the private health services, due to the financing, almost in totality, by the state. As mentioned in that report, the health private system is still feasible if it will continue to be financed by government.

Public health and private sector are changing significantly. Private offer is now abundant, generally with better quality and in some cases with high technology. (*Relatório de Primavera, 2008*)

1.1.2 PRIVATE HEALTH INSURANCE

The general definition of the health insurance describes it as a form of insurance that pays for medical expenses. Sometimes it is used more broadly to include insurance covering disability or long term nursing custodial care needs. It may be provided through a government-sponsored social insurance program, or from private insurance companies. The health insurance may be purchased on a group basis (e.g., by a firm to cover its employees) or purchased by individual consumers. In each case, the covered groups or individuals pay premiums or taxes to help protect themselves from high or unexpected healthcare expenses. Similar benefits paying for medical expenses may also be provided through social welfare programs funded by the government. By estimating the overall risk of healthcare expenses and developing a routine finance structure (such as a monthly premium or annual tax) that will ensure that money is available to pay for the healthcare benefits specified in the insurance agreement. The benefit is administered by a central organization, most often either a government agency or a private or not-for-profit entity operating a health plan.

In the Portuguese case, the health insurance is provided only by private insurance companies and it is cumulative to the public service and the participation in these schemes is voluntary.

The Portuguese supervisor entity is named *Portuguese Association of Insurers* (*PAI*), it was funded in 1982 and is a nonprofit entity, which joins the insurance companies and reinsurances that operate in the Portuguese market besides their nationality. The group of insurers that belong to *PAI* represent more than 99% of the insurance market regarding the business volume and total employees.

PAI is the entity that represents the insurance sector, the principal objectives of are:

- Represent and defend the interests of their associates in a national and international level;
- Promote the cooperation between the associates and defend their common positions;

- Contribute to the modernization, the prestige and the development of the sector;
- Give support to their associates, particularly trough the realization of technical studies;
- Organize and manage services that are common interest for the companies of the sector;
- Support any other actions that are an interest for insurance companies-

Private health insurance represents, on average, only a small share of total health funding across the *OECD* area. These insurances play a significant role in health financing in some *OECD* countries and it covers at least 30% of the population in a third of the *OECD* members. (Colombo and Tapay, 2004)

In Portugal, in the year 2007, about 1,7 million persons were insured[4]. According to *Basef Seguros* study from *Marktest*, June 2008, 1,9 million Portuguese citizens with age over 15 years old have a health insurance.

As mentioned by Colombo and Tapay, 2004, the private health insurance is a complex financing mechanism that affects and interacts with public systems in multiple ways. Some have argued that the private sector has the ability to find more responsive and efficient answers to policy challenges facing health systems, and would enable governments to cut public health sector costs. As a result, supporters see private health insurances markets as more dynamic, innovative, and sensitive to individual preferences and consumer demands than public systems, which are conversely plagued by bureaucratic slowness and rigidities. Private health insurers also often offer a considerable array of products to their consumers and therefore have the potential to promote choice of benefits and financial protection schemes and better meet individual preferences.

[4] *PAI, APSBreve* #57, 16 June 2008

1.1.2.1 CHARACTERISTICS

The health insurance is a private contract between the insurance company and the policyholder, which sets the level of an insurance premium in exchange for a set of coverages in the health care domain. Against the payment of the premium, the insurance company has the duty, in the case that any risk event occurs that is covered by the insurance, to reimburse the insured person by their spends, or satisfy the provision for the medical and health care which are necessary to the recovery of the patient through the financing of the providers.

As mentioned by Pita and Simões (2007), the majority of health insurances policies in Portugal are valid for only one year and consequently companies have the power to cancel and/or refuse to renew the contract. In addition, policies tend to be selective and lack comprehensiveness: as age is strongly associated with increased health care costs, many companies will try to exclude anyone over 65 or 70 years old. However this is a tendency that is changing and it is becoming usual to get health insurances without age limits.

Some definitions of the health insurance terms:

- The policyholder is the person who hires the insurance and the responsible for the payment of the premiums.
- The insured person is the one who holds the insurance, whose health or physical integrity is insured, and who is entitled to benefit under the policy.

The health insurance contract is composed by the insurance proposal, the individual medical questionnaire and medical documentation necessary for the acceptance of the risk from the insurance.

- The insurance proposal is a formulary of the insurance company that has to be filled in by the policyholder or by each candidate. The content of this document has enough information to accept or refuse the insurance contract.
- The measure of the medical risk is essential; therefore the insurance company makes an individual medical questionnaire to all candidates to be insured using a patient's medical history to screen out those whose pre-

existing medical conditions pose too great a risk for the risk pool. In general, those who present pre-existance diseases are considered as exclusion or charged high premiums to compensate.

This formulary has a set of health indicators in order to constitute a profile and a clinic history, which can correctly quantify the risk to be assumed by the insurance. Some of the contents of the questionary may be the name of the actual medical practioner/ health institution used, the biometric indications (height, weight and blood pressure), general questions about habits, life style, diseases or disturbs and the personal health history.

The medical questionnaire is also a mean to avoid what the insurance company's name "adverse selection", which is the tendency for only those who will benefit from insurance to buy it. Unhealthy people are more likely to purchase health insurance because they anticipate large medical bills. On the other side, people who consider themselves to be reasonably healthy may decide that medical insurance is an unnecessary expense.

- Beside the information of the individual medical questionnaire, regarding the age of the person and the guarantees wanted, the insurance company is able to request further medical exams to get a good risk evaluation.

The Documents that set out terms and conditions and are part of the health policy are:

- General Conditions, clauses that define and regulate the general terms and common responsibilities under the insurance policy.
- Special Conditions, clauses defining the benefits applicable under the general conditions;
- Specific Conditions, the specific aspects of each insurance policy as reflected in the individual supplied to each household;
- Policy, the contract between the policyholder and the insurance company that includes the agreed general, special and specific terms and conditions and all policy endorsements.
- Policy Endorsement, changes made to the terms and conditions of the policy.

Insured people can benefit from the guarantees of the health contract if they satisfy the follow conditions:

- Satisfy the insurance company acceptance conditions, in function of the risk evaluation parameters like the pre-existing diseases, the limit age of underwriting;
- Fill properly the individual medical questionnaire, truthfully and with full disclosure;
- Be accepted by the insurance;
- Accept the utilization rules of health care.

The admit ion of the insured person will be confirmed by the insurance, but it can have some restrictions as the elimination period and exclusions.

- Elimination period, time between the date of the beginning of the insurance or the date of the inclusion (if it is the case of a group policy) and the date when the guarantees can be used. For example, the elimination period for the childbirth coverage can be around 18 months;
- Exclusions, there are several pathologies excluded by the health insurances. There are also some aggravate risks which became from the possibility of need health care due to the professional area, style of life or family history. Under these circumstances, the risk can be accepted with limitations. Some of the exclusions for aggravate risks are the pre-existing diseases or accidents occurred prior to the effective date of the health insurance, professional diseases or accidents, mental illnesses, plastic surgery, Haemodialysis and others.

Citizens, families and companies can subscribe the health insurance; therefore it can be sign up as two modalities: Individual and Group.

In Portugal, more than half of the policies are Group insurance provided by the employer, and the others are Individual policies (50.9% in 2004 and 52.2% in 2005 (*INE*, 2006)). For 2006, 56% were group polices and 44% individual policies. (*PAI*, Estat_Doença_2006)

- The individual policy is underwritten by a singular person and can be extend to the dependent family;
- The group policy is usually hired by a collective person (policyholder), and covers a set of people who have an entail or an interest in common.

  The group insurance can be contributively, if the insured people contribute total or partially to the payment of premium or non-contributively insurance, when the policyholder contributes totally to the payment of the premium.

  Companies have being celebrating health insurance contracts to their employees as an extra payment and also as their social responsibility.

The health insurance can assume two modalities regarding the system of medical claims payment:

- Reimbursement: in this classic type of insurance, the insured person has the responsibility and is free to choose any health provider (hospital entities, doctors or medical units). The medical expense is totally supported by the insured person who, afterwards, will presente the expense to the insurance company to be reimbursed under terms and restrictions for each annual period, set out in the specific conditions and after deducting relevant excess and co-payments.

- Managed Care: this is a more recent kind of insurance. In this system the insured person has the access to a network system of managed healthcare, with healthcare providers and prices established in a previous contract. Concerning the choose of the healthcare, the insured person can decide by two options:
  - -Visit a provider that belongs to the network system, being incharged (if it is establish that way) for a part of the expense, the co-payment as defined in the contract with the insurance company.
  - - Visit a provider out of the network. In this case, the contract works like the reimbursement modality. As a consequence, the reimbursement percentage would be, in the majority of private health insurances, less than the one in the network; this is the case of mix insurance.

Table 1.9 - Managed Care/ Reimbursement - Premiums structure

Percentage	2002	2003	2004	2005	2006
Reimbursement insurance	41%	31%	26%	21%	27%
Managed Care insurance	59%	69%	74%	79%	73%

Source: *PAI*, Estat_Doença_2006

The evolution of the numbers above shows the increase and the preference of the managed care system. This raise is partly due to the net of providers in each health insurance company that has increased, which allows a significant choise for the insured person with certainly lower costs.

Table 1.10 – Managed Care/ Reimbursement – Insured People

U: Th ousand	2002	2003	2004	2005	2006
Reimbursement insurance	268.058	400.316	437.150	415.970	480.828
Managed Care insurance	678.262	832.959	873.494	985.109	1.136.093

Source: *PAI*

As the table of premiums structure expressed, the number of insured persons with the managed care option is the majority.

COVERAGES / PLAN INSURED

The health insurances companies have almost the same coverages in the market. This insurance has more than a few ways to compose the plan of the policy due to the arrangement of the different coverages, annual limits and percentage of reimbursement. The insured person is free to choose the product wanted from the ones available in the insurance company.

The most common coverages are:

Table 1.11 – Health Insurance Coverages

COVERAGE	DESCRIPTION
IN-PATIENT	The benefit is for provision of in-patient health care including outpatient care, subject to clinically proven need for such in-patient care. Eligible expenditure under in-patient cover is that related to payment for medical treatment, surgery or laboratory analyses that require resources and specific services that can only be provided and performed as an in-patient in a hospital environment, namely the following between other:

COVERAGE	DESCRIPTION
	▪ Fees related to treatment carried out in the hospital namely for doctors/surgeons, anaesthetists, assistants and instrument costs; ▪ Supplementary Diagnostic and Therapeutic resources associated with the treatment carried out in the hospital environment; ▪ Nursing fees related to in-patient treatment; ▪ Resources used in in-patient treatment (operating theatres, recovery ward, private room or nursing ward); ▪ Surgically implanted Prosthetic Devices
CHILDBIRTH	The insurance company undertakes to ensure access for the insured person, in terms of and to the limits established under the Specific Conditions, to in-network healthcare service providers in terms of natural childbirth, caesareans and voluntary interruption of pregnancy except for illegal abortion
OUT-PATIENT	Eligible expenditure under in-network healthcare service provider cover is that related to payment for medical treatment, surgery or laboratory analysis, that does not require to be provided and performed as an in-patient, namely: ▪ Medical visits ▪ Medical fees related to out-patient; ▪ Supplementary Diagnostic and Therapeutic resources associated with out-patient treatment provision; ▪ Medicines administered during such treatment period; ▪ Materials, equipment and products associated with outpatient treatment; ▪ Nursing fees related to out-patient treatment; ▪ Home nursing care ▪ Ambulance or other means of transportation from and to health care centres, providing the insured person's health condition so requires;
MEDICINES	Reimbursable expenses are only paid after the assumptions below are verified ▪ Medicine should be prescribed by a registered practitioner and be for treatment of lesions arising from illness or accident covered by the contracted benefit; ▪ Depending on the case, the original or copy of the medical prescription, countersigned by the supplying pharmacy and to include package price tag and/or barcode, or prescribed medicine registration number and corresponding receipt should be sent to the insurance company. The claim should clearly and legibly set out the medicines supplied and the amounts, following deduction of reimbursable amount

COVERAGE	DESCRIPTION
	where these apply, paid by the insured person
DENTAL	Reimbursable expenditure under policy cover for healthcare providers within the approved network relate to: ▪ Visits ▪ Dentistry (restoration and filling of cavities) ▪ Periodontology (removal of tartar) ▪ Minor Oral Surgery ▪ Prosthetic Devices ▪ Orthoses (corrective apparatus) ▪ Supplementary Diagnostic Methods
PROSTHETIC DEVICES/ ORTHOSES	▪ Prosthetic Devices All clinically conceived and/or recommended instruments designed to replace, totally or partially, a member of or organ in the body. ▪ Orthoses All clinically conceived and/or recommended instruments designed to help, totally or partially, the functioning of a member of or organ in the body.

FISCAL BENEFITS

The Portuguese government had established fiscal benefits that contribute as an incentive to invest in health insurances.

According to the article 86º from *CIRS*, the amounts spend in the health insurance premiums; allow a deduction to the collective income of 30% for individual and 15% of the total expenses related to salaries to group policies.

1.1.2.2 HEALTH INSURANCE PREMIUM CALCULATION

In the Portuguese health insurance market, there are three different groups to be rated.

The Individuals, the Small Groups, which are enterprises with less than fifty employees and the Large Groups with more than fifty employees.

Usually for the Individuals and Small Groups, the insurance market has standard polices. For the Large Groups, the rating options are the various; there are several methods that an insurance company may use to determine the premiums to charge a small group for health insurance.

For the Individuals, premiums will generally vary by age and gender but not with health conditions.

Premium rates in the Small Groups market are generally subject to rating band limitations, determined on case characteristics, consisting of age and gender of employees, location, number of employees and type of insurance product.
The most common rating method for small group health insurance is age banded rating. With this method, the insurance company provides a different rate for each employee, based on the age of that employee. Typically, the older the employee, the higher the premium that will be charged for that employee's portion of the group health plan. The insurance company sets these age-banded rates by looking at claims history for persons under other group health plans that are of similar age. Rates usually increase with age because claims also increase with age as a person develops more health conditions, as they get older. The insurance company may look at other factors in determining the age-banded rates, such as the geographic location of each employee's residence and their gender. Some insurance companies base rates on the geographic location of the business and not that of the employees.
The Large Groups are rated through two different methods. The methods used by insurers to establish health insurance premiums are the Community Rating and the Experience Rating.

- The community rating is the standard for setting health insurance premiums, which eliminates health status, age, gender or claims history.

  Its principle is to average the cost of medical care not only among all individuals having the same expectations of loss, but also among others of different degrees of risk. Both low-risk and high-risk classes are factored into community rating, which spreads evenly the expected medical care costs across the entire community

  With community rating method, for a given level of cover, everyone pays the same. Pure community rating is rarely used; it is uncommon because it is a good deal for older people, who would otherwise pay higher premiums, but not for people who are younger. Most countries do not use pure community rating because younger people feel they cannot afford it, and drop out of the health plan. When younger people drop out of the group plan, only the sick and the elderly remain, which is not a boon for insurance companies.

  "Community rating is controversial in the health policy community. Some feel that it drives premiums higher, forcing lower-income individuals to go uninsured. Others believe that it offers a crucial opportunity for those with expensive health problems to obtain affordable coverage."(Kelly Montgomery, About.com)

  Modified community rating, however, is a common underwriting method under which a managed care organization categorizes its members into classes or groups based on some common characteristics as age, gender, type of economic activity or demographic factors and then charges all members of a class or group the same premium. The plan cannot consider the experience of a class, group, or tier in developing premium rates. Also known as modified community rating or community rating by class.

  Another rating option is called composite rating. Under a composite rating method, the insurance company will calculate one set amount that will be charged for each eligible employee enrolled in the group health plan. For companies that offer this rating option, they calculate the average premium based on the persons enrolling when the group health plan is first established. They add the total age banded rates together for all persons

enrolling, and then divide that number by the number of employees. Composite rating allows for ease of record keeping for the employer and equals the amount of contribution he makes per employee, thus providing equally valued benefits to each employee. Most insurance companies will only allow composite rating if the total number of employees enrolled in the group health plan exceeds a minimum number, such as 10.

- A premium rate based on the observed claim rate for a heterogeneous portfolio might prove quite inadequate if, as is likely, the mix of risks were to change. To reduce this danger, policies are usually grouped according to the different levels of the various risk factors involved. Claim frequency rates and premiums for the different groups are then calculated. This approach to the problem is called group rating. (Hossack et al., 1999)
  Experience rating or risk selection method is *a* system used by insurers to set health premiums based on the insured's past loss experience, which analyzes a group's recorded healthcare costs by type (claims and health care usage), and where the risk is distributed equally over all groups according to their health status. The group's premium can be partly or completely calculated according to the group's experience.

The methods described above calculate the pure premium, which is the amount that corresponds to the expected claims that the insurer will have to pay. In the case of the health insurance, the expected amount of claims is the amount of benefits that the insurer will pay in order to provide the medical care assistance hired with the policyholder.
Over the pure premium there are other factors that contribute to the final premium to charge to the policyholder. The cost of advertising, selling, paying for services rendered by health care practitioners, administration of the insurance program as well as the investment of premium payments and a profit margin are factored into the premium amount.
Additional underwriting factors, such as adverse selection for individual policies and special industry exposures for employer-sponsored group health insurance plans, are also factors of the premium charged.

The Policyholder often can control several factors used to determine the insurance premium. Some of these factors, which act as limitations of the insurance coverage, include:

- Deductibles - The amount the policyholder has to pay out-of-pocket before reimbursement of expenses from the insurance coverage. The patient pay 100 percent of the first portion of their medical costs up to a specified maximum before his insurance plan picks up all or part of the remainder of the price of the services.
  Depending on the chosen amount, it may take several medical acts before the policyholder reaches the deductible amount and the health plan starts to pay for care. The higher the deductible, the lower the premium;

- Copayments – The amount that the policy-holder must pay out of pocket for a particular medical act each time they use that service. The higher the co-payment, the lower the premium;

- Coverage limits - A mechanism by which policyholder is reimbursed for a medical expense up to a maximum amount of money, or a maximum amount of services. In addition, some plans have annual coverage maximums. In these cases, the health plan wills stop payment when they reach the benefit maximum. Any expenditures above that or services above the limits become the responsibility of the policyholder. The higher the coverage limits, the higher the premium;

- Out-of-pocket limits - the maximum amount of deductible and co-payments that the policyholder has to pay each year. The policyholder payment obligation ends when they reach the out-of-pocket maximum, and the health plan pays all further covered costs. Out-of-pocket maximums can be limited to a specific benefit category (such as prescription drugs) or can apply to all coverage provided during a specific benefit year;

- Coinsurance - In which the policyholder must pay a percentage of the total cost. Because there is no upper limit on coinsurance, the policyholder can end up owing very little, or a significant amount, depending on the actual costs of the services they obtain. The higher the coinsurance, the lower the premium;

- In- Network Provider – A health care provider on a list of providers preselected by the insurer. The insurer will offer discounted coinsurance or copayments, or additional benefits, to a plan member to see an in network provider. Generally, providers in network are providers who have a contract with the insurer to accept rates further discounted from the usual and customary charges the insurer pays to out-of-network providers;

- Coordination of Benefits - some insurance companies now offer insurance plans which recognize the fact that other insurance may be available to the policyholder, such as coverages under worker's compensation, automobile insurance, a state disability program, or from coverage available as an employee benefit to a spouse. This provision specifies how multiple coverages will coordinate their payments;

- Renewability/Cancellation - some insurance companies offer health insurance on a guaranteed renewable basis or with a non-cancellation provision (meaning that the insurance company may only cancel coverage in the event of non-payment of premium). Expect there to be an added cost for these features;

1.1.3 HEALTH INSURANCE MARKET

Although the basic principle of public health system is "… universal and global, which, regarding the economic and social conditions of citizens, is free"; many people hire a health insurance. Private sector has been supporting and covering the insufficiencies verified in the public sector. Nevertheless, private consumers cannot leave *SNS*, and *SNS* benefit from their contributions.

According to the *OECD* research into public spending efficiency, the Public satisfaction with the health care system can be a criterion for assessing its performance. Satisfaction is, however, affected not only by people's experiences with the health system but also by their expectations, which are likely to vary significantly across countries and over time.

The Private health insurance is increasing in many countries. There are several reasons associated with this raise as the growing dissatisfaction with public health care, the liberalisation of markets and the increased international trade in the insurance industry, as well as overall economic growth allowing higher and more diversified consumer demand. (Drechsler and Jütting, 2005)

Other reasons for the increasing of the private health insurers are associated with the constant medical innovation, the difficulty in accessing the *NHS*, the increase of the offer and the current tax incentives encouraging high earners and companies.

The insured person hires a private health insurance in order to fulfil some of the public system gaps and expects to get from the insurance more efficiency; quality and comfort in the health care assistance domain. With the insurance, there is no need to wait; in case of in-patient, there is the possibility of choosing a private room with all the comfort required. Another important issue is the free choise between a large and broad providers network in professional agreement with the insurance company.

The global insurance premiums amount has increased, in the period 1998–2004 at an annual average rate just below 20% (*INE*, 2005). Between 1995 and 2007, the

health insurance market has increased 5.4 times concerning the direct insurance premiums, from 102 to 440 million euros (*PAI, Relatório Mercado 2007)*.
In 2007, the increases of the health segment was almost 8%, which correspond to the tendency of the last years.

Table 1.12 – Health Direct Insurance Premiums

Million €	2002	2003	2004	2005	2006	2007
Premiums	273	315	346	372	408	440
Variation	20,0%	15,4%	10,2%	7,2%	9,7%	7,9%
% of direct premiums over GDP	0,21%	0,23%	0,25%	0,26%	0,27%	0,29%

Source: *PAI*, Relatório de Mercado 2007

As the previous table displays, direct premiums have raised every year, some years more than others. The variation for 2007 is 7,9% below the previous year with 9,7% of increase.

According to Pita and Simões 2007, approximately a quarter of the population enjoys a second (or more) layer of health insurance coverage through health subsystems and voluntary health insurances.

Table 1.13 – Number of Health insured persons

U: million	2002[1]	2003[1]	2004[1]	2005[1]	2006[1]	2007[2]	2008[3]
Number of health insured persons	1.3	1.4	1.4	1.5	1,6	1,7	1,9
Variation		6,2%	4,3%	4,8%	6,7%		

Source: [1] *PAI, CGD*; [2]*PAI, APSbreve, 16 June 2008*; [3]*Marktest, June 2008*

The health insurance market presented in the last years a sustained evolution, which represents the increasing acceptance of the Portuguese consumers about this product.
The current number of health insured persons is actually around 1.9 million consumers.

Table 1.14 – Health Gross premiums, Group vs Individual

Thousands euros	2004[1]		2005[2]		2006[2]	
	Gross Premium	%	Gross Premium	%	Gross Premium	%
Group	183 170	54%	210 044	56%	218 127	53%
Individual	156 419	46%	164 385	44%	190 321	47%

[1]represents a sample of 97%; [2]represents a sample of 99,9%
Source: *PAI*, *Estatistica do Ramo Doença,* 2004, 2005-2006

Companies, in favour to their employees, celebrate the major part of insurances, but the individual segment has also an important dimension. As the data available of *PAI* presents, according to the amount of gross premium, 53% of premiums correspond to Group policies in the year 2006.

1.2 GERMANY HEALTH SYSTEM

1.2.1 HEALTH CARE CONTEX

According to *OECD Health Data 2008, How Does Germany Compare*, the health spending accounted for 10.6% of GDP in Germany in 2006, more than 1.5 percentage points higher than the average of 8.9% in *OECD* countries.
Only the United States (15.3%), Switzerland (11.3%) and France (11.1%) allocated more of their GDP to health than Germany in 2006.
Moreover, Germany ranks only 10th among *OECD* countries in health spending per capita, with a spending of 3,371 USD per person in 2006 (adjusted for purchasing power equality). The *OECD* average in 2006 was 2,824 USD per capita.
Health spending per capita in Germany increased, in real terms, by 1.4% per year on average between 2000 and 2006. This was the smallest increase among all *OECD* countries during this period.
The relatively slow growth in health spending in Germany is partly due to cost-containment measures that have been introduced in the context of health reforms.
In Germany, 77% of health spending was funded by public sources in 2006, above the average of 73% in *OECD* countries.
In 2006, life expectancy at birth for the whole population in Germany stood at 79.8 years, nearly a year more than the *OECD* average of 78.9 years.

As mentioned in *Economic survey of Germany 2008: Moving towards more sustainable healthcare financing,* in the face of considerable spending pressures stemming from technological and demographic changes, Germany needs to reform healthcare financing to make it efficient and limit the negative impact on employment and growth. The predicted gradual increases in budget contributions to the social health insurance system will help reduce non-wage labour costs, if and when they materialise, as general taxes draw on a larger base than labour-income-dependent social insurance contributions, which are the main financing source of the social health insurance system now.
The new financing system for the social health insurance system linked to an improved risk structure adjustment between insurers could reduce the incentives

for risk selection and improve the chances for competition between insurers to lead to higher cost-effectiveness, but to avoid distortions some aspects of the design will have to be corrected before the system is introduced in 2009.
The largest part of the system's costs will continue to be financed by labour-income dependent contributions, protecting lower income earners, while the price signal will come from a surcharge that those insurers that otherwise cannot cover their costs will have to levy on their members. (…) Moreover, the associated redistribution will be financed within surcharging insurers' memberships, putting insurers with a large share of low-income earners at a competitive disadvantage, because they will have to levy higher surcharges on higher income members. (…)
The current segmentation of the health insurance system will be maintained, raising equity and efficiency concerns. Private health insurance members are both healthier and wealthier on average than social insurance members and segmentation leads to less efficient risk pooling, leading to higher social contributions and ultimately to lower employment and economic growth with negative effects for society at large. In addition, it raises equity concerns to exempt private health insurance members from contributing to the financing of the various re-distributive tasks performed within the social insurance system, such as free co-insurance of family members without own income. Private health insurers should be included in the new financing system.

In Germany the options available for health insurance while living in Germany are:

- Government-regulated public health insurance system;
- Private health insurance from a German or international insurance company;
- combination of the two.

Government Health System

Most German residents are members of the government health system *(Gesetzliche Krankenversicherung or GKV)*. If the gross annual salary is below 48,150 Euros per year or 4,013 Euros per month, membership in the GKV is mandatory. The total cost of government health insurance is currently approx. 15% of gross salary up to a maximum monthly income of 3,600 Euros. If a person

earns more than this amount the insurance premium remains constant. The employer will normally pay slightly less than half of the monthly premium.

GKV benefits include in-patient (hospital) care as a ward patient with doctor on duty at your nearest hospital, out-patient care with registered doctors *(Kassenärzte)* and basic dental care. The non-working dependents resident at the emplyoee address in Germany is included in the insurance with no additional cost.

Members of the GKV will join one of the 250 "*Krankenkassen*" in Germany (non-profit associations administrating the government health scheme). The health insurance funds adhere to established government regulations on what they offer.

The employee and their dependents are automatically enrolled in the government long-term nursing care scheme. This presently costs 1.95% of the gross salary (a maximum of approx. 80 Euros per month) of which the employer pays half.

For those seeking to upgrade their medical coverage, for instance the right to consult a private doctor, to homeopathic remedies, a private room in hospital and higher dental reimbursements, supplemental insurance coverage is available which can top up the government system benefits.

Private Health Insurance

It is possible to opt for private health insurance *(Private Krankenversicherung or PKV)* instead of joining the government health plan if the gross annual salary is presently more than 48,150 Euros and has been more than 47,700 Euros per year for each of the past three years. If not, automatically the person is registered as a voluntary member of the government system and will not be able to change to a private insurance plan until the person have been a member of the government system for up to 3 years.

Generally, private health plans cover a wide choice of medical and dental treatment and provide broad geographical coverage. Private patients generate higher earnings for medical professionals and will usually be treated by senior doctors.

The cost of full medical insurance is based on the benefits chosen, as well as on the age, gender and any pre-existing conditions of the insured. The monthly

cost of the private insurance czn is reduced by agreeing to a deductible. Private insurance premiums are based on the insured individual and do not automatically include the dependents who will be covered under the policy at their own individual rates.

By purchasing a private medical insurance plan from a German health insurance company that provides a certificate recognized by the German government *(Arbeitgeberbescheinigung)* it has the advantage of the same employer subsidies as a government plan member.

Everyone, whether state or privately insured, must pay into the government long-term nursing care scheme.

The principal characteristics of the *Private Health Insurance* are:

- Whole life guarantee: while the premiums are being paid by the policyholder, the insurance company cannot cancel the contract or reduce the coverages ("once private, ever private");
- Benefits/Coverages similar to the public system;
- Level premiums: As the actuarial assumptions, the total future benefits must be equal to the total future premiums, having into consideration a certain expected income rate. The premiums can be corrected on base in the medical inflation costs.

There are several specificities of this insurance, where can be highlighted the following:

- Application of an extra premium (about 10%) until the age of 60 years in orders to finantiate the high claims ratio that occurs in the higher ages.
- Existence of profit sharing clauses that distribute at least 80% of the balance to apply to the reinforcement of the technical account with insured persons with higher ages.

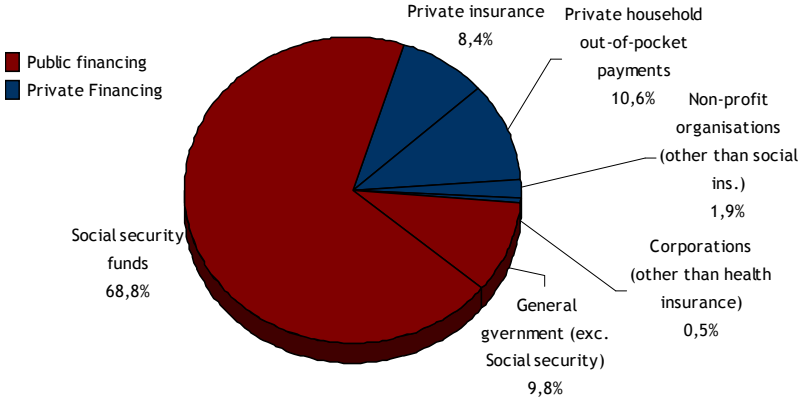
The transfers between public and private have very specific rules, once the alternative system has a whole life guarantee. If one person leaves the public system and get into the *PHIS*, that person can only get back to the public

system if their income is less than the minimum amount 40.500€/year or if the person has less than 55 years old.

1.2.2 PUBLIC VS PRIVATE HEALTH MANAGEMENT

In Germany, public funds financed 79% of the total expenditure: The general government paid 10% and social security funds financed 69% of the total health expenditure in 2001. Private households paid 11% of the total expenditure. 28% of the expenditure of the private households was spent on pharmaceuticals, of which 18% was on over-the-counter medicines and 10% as co-payments for goods and services such as pharmaceuticals. 20. 8% of the total expenditure was paid by private insurance enterprises, 2% by nonprofits organisations and 1% by corporations (for occupational health care). The next figure illustrates the exposed.

Figure 1.9 - Health expenditure by financing agent (Total health expenditure=100), Germany 2001



Source: *OECD* Health Technical Pappers no.4, Sha-Based Health Accounts in thirteen *OECD* countries, Country Studies: Germany National Health Accounts 2001, Natalie Zifonun

1.3 FRENCH HEALTH SYSTEM

1.3.1 HEALTH CARE CONTEX

According to *OECD* Health Data 2008, the health spending accounted for 11,1% of GDP in France in 2006, more than 2 percentage points higher than the average of 8.9% in *OECD* countries.
Only the United States (15.3%) and Switzerland (11.3%) allocated more of their GDP to health than France in 2006.
On the other hand, France ranks over the half of the *OECD* countries in health spending per capita, with spending of 3,449 USD per person in 2006 (adjusted for purchasing power parity). The *OECD* average in 2006 was 2,824 USD per capita.
The public financing represents the principal source of health financing expenses beneath the other *OECD* countries, with the exception of United States and Mexico.

In France, 79,7% of health spending was funded by public sources in 2006, above the average of 73% in *OECD* countries.
In 2006, life expectancy at birth for the whole population in France stand has increased more than ten years between 1960 and 2006, which is close to the data of half of the *OECD* countries.

In France the health care system is compulsory and covers the entire French population. The French citizens can acced to the public health service through the payment of fees.
All population have to be inscript in the Social Security in the "compulsory regime". This institution is responsible for part of the health expenses, and reimburses part of the conventioned tariff. This regime reimburses a percentage of that tariff according to the nature of the medical act. The taxes of the Social Security change for the different social security regimes.
The compulsory regime leaves a tax charge to the citizen, which is the difference between the conventioned tariff and the percentage assumed by the compulsory regime. There are some health conditions in which there in no tax charge. The type of the regime in which each citizen is inscript depends on the personal or professional situation.

There are five kinds of compulsory regimes of the Social Security:

- Global regime for the workers hired; it is managed by the Caisse nationale d'assurance maladie (Cnam) and for Caisses primaires d'assurance maladie (Cpam). There is a special regime for the employees who work in Alsace-Moselle and for some kind of employees namely the civil servants and military servants.
- Compulsory regime for the independent employees; it is reserved to the artisans, industry servants and liberal professionals.
- Agricultural regime (Amexa); for the agricultural workers and it is managed by the Mutualité Sociale Agricole (MSA).
- Students regime; it is compulsatory for all the students with an age over 20 years old and who study in a superior establishment recognized by the French state.
- Resident regime; Funded in the year 2000, it covers all the persons that live in France and do not benefit from any other social regime.

Private Health Insurance

The private health insurance is an additional insurance to french compulsory regimes with the exception of incapacity and disability covers.

Private health insurances can have a whole life guarantee, named "Garantie Viagère", with an eliminate period of 2 years that can be extend until 3 years.

In the case of group policies with compulsory adhesion, the complementary insurers (Insurances companies or Mutuals), cannot refuse the acceptance of the responsibility of pre-existing diseases. There are no elimination periods in the compulsory group policies.

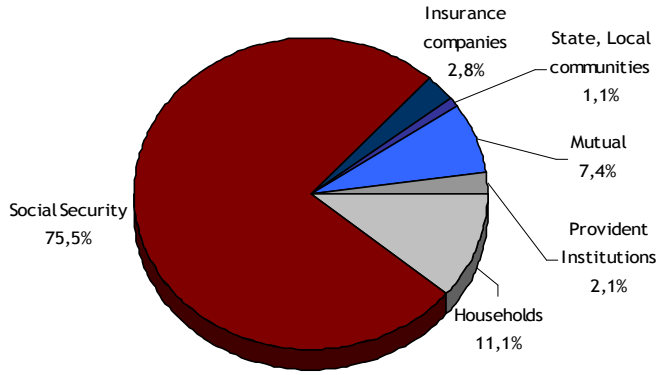
In the individual or group policies with optional adhesion, the contracted guaranty is for lifetime since the date of adhesion. Since the contract is done, the insured person has the right to maintain the guaranties and the insurer cannot put an end

to the contract, but can chance the tariff according to the tariff category but not according to the person health status.

However, there is a clause in which the insurer is allow to examine during 2 years the claims costs of the insured person. If during that period the costs are excessively high, the insurer can decide to cancel the contract.

1.3.2 PUBLIC VS PRIVATE HEALTH MANAGEMENT

Figure 1.10 - Financing structure of health expenses



Source: *INE, Contas nacionais da Saúde de 2001*

In France, Social Security financed 75,5% of the total expenditure in 2001. Private households and Mutual are the following concerning the financing amount with 11,1% and 7,4% respectively. Insurance companies have only financed 2,8% of total expenditure.

1.4 COMPARISON OF HEALTH SYSTEMS

This section aims to compare the Portuguese, Germany and French health systems concerning the main figures related to their health systems.

Table 1.15 – Expenditure on Health, comparison countries

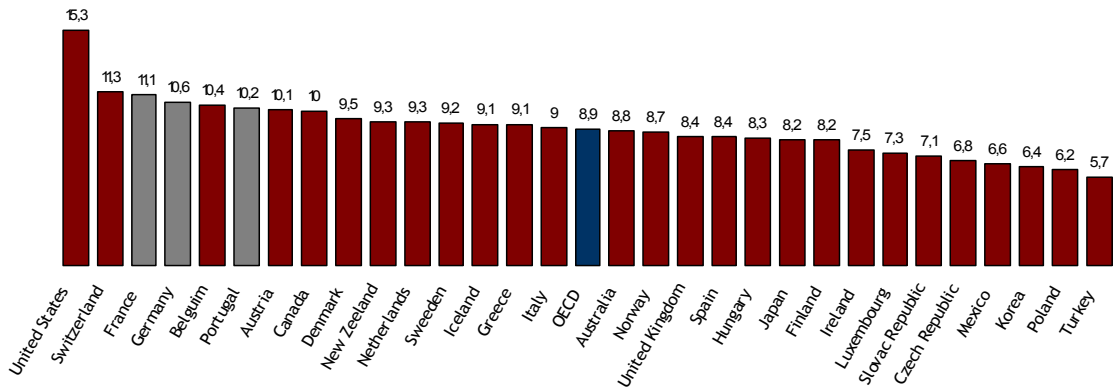
YEAR 2006	Portugal	Germany	France
Total expenditure on health % Gross Domestic Product	10,2	10,6	11,1
Public expenditure on health % total expenditure on health, TEH	70,6	76,9	79,7
Total expenditure on health /capita, US$ purchasing power parity	2 120	3 371	3 449

Source:*OECD* Health Data 2008 – Version: June 2008

As the previous tables illustrates, France is the country with higher expenditure on health as a percentage of the GPD. Germany and Portugal have almost the same volume of health expenditure.

Regarding the total health expense per capita, Portugal presents a lower spend, which is a reflect of being a less rich country.

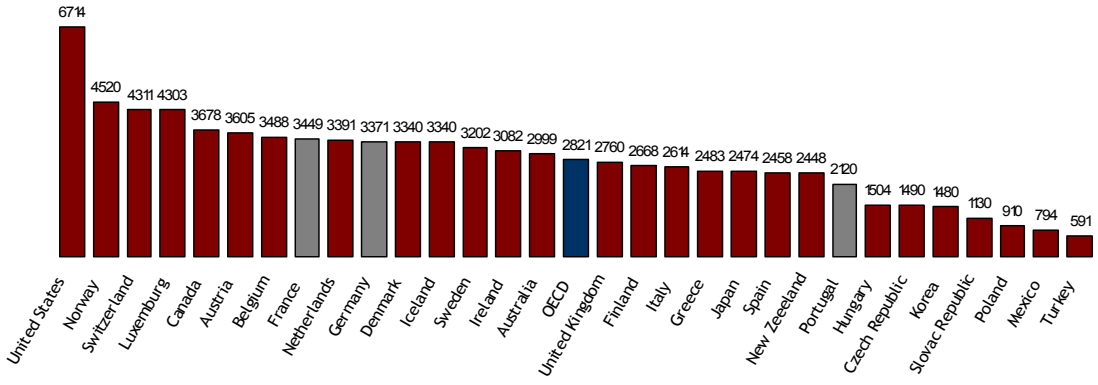
Figure 1.11- Health expenditure as share of GDP, OECD countries, 2006



Source: OCDE Health Date 2008, June 2008

In an overview between all *OECD* countries, the three countries in analysis are far above the *OECD* average concerning health expenditure as share of GDP, which is 8.9.

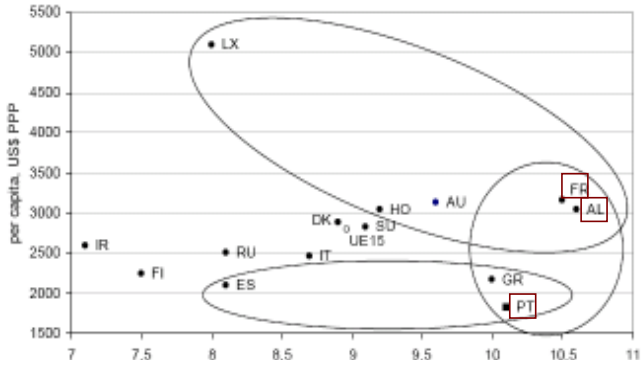
Figure 1.12- Health expenditure per capita, *OECD* countries, 2006 (USD PPP)



Source: OCDE Health Date 2008, June 2008

The health expenditure per capita differs from Portugal to Germany and France. Portuguese amount of health expenditure per capita is 2.120 USD far below the OECD average of 2.821 USD, Germany with 3.371 USD and France with 3.449 USD.

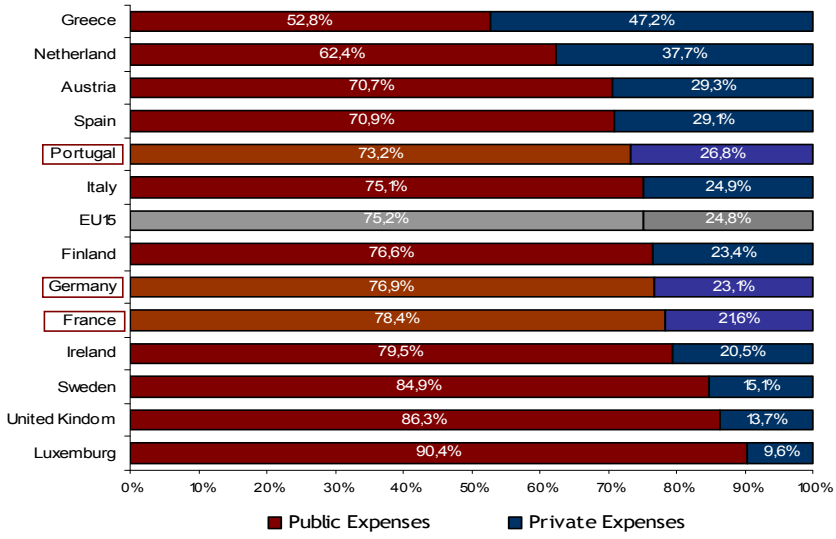
Figure 1.13 – Total Health expense in GDP and total expense per capita, (US$PPP), 2004



Legend: AL-Germany; AU-Austria; DK—Denmark; ES-Spain; FI-Finland; FR-France; GR-Greece; HO-Netherland; IR-Irland; IT-Italy; LX-Luxemburg; PT-Portugal; RU-United Kingdom; SU-Sweden
Source: *OECD* Health Data 2006, October 2006

Nevertheless the data of the previous figure refers to the year 2004, the performance of the expenses is still similar in the year 2006. The figure above shows the relation between the total health expenses in GDP and the health expenses per capita. The circle on the bottom right figure, contains the three countries in study, it could be assumed as a cluster that joins the countries with higher expenses as share of GDP, although Portugal has a lower per capital amount of expenses.

Figure 1.14 - Public and Private health expenditure - 2006, comparison countries



Source: *OECD* Health data 2006, October 2006

The previous figure, illustrates the share in the public and private health expenses. Portugal has a public participation in health, slightly below the average of the EU (15 countries) with 73%. This, means that Portugal spend more than the average of EU countries concerning the wealth procuded in the country. Germany and France have a higher expenditure concerning the public expenses than the average of EU countries.

2. AN APPROACH TO THE WHOLE LIFE HEALTH INSURANCE

Health is a vital condition for everyone. The health insurance is a good help in the preservation of a healthier status. Once the concerns and demands in this matter are growing and the population is getting older, the whole life health insurance is something that will cover up the existent market insurance gap and the citizens needs.

The *ISP,* while a control authority has established as priority, the development of the basic regulation about the lifetime health insurance exploration. The insurance market has already some health insurances that cover the risk for higher ages. However, in order to contribute to the development of lifetime health covers, the *ISP* finds suitable the regulation of some technical aspects to adjust prudent rules. (III Fórum do Sector Segurador e de Fundos de Pensões,*"O Sector e o Sistema de Segurança Social – Perspectivas para 2008",* Lisboa, 4 de Março de 2008)

In this section, it is purposed an approach to a methodology for the calculation of the level premiums to the whole life health insurance.

To this intent, it was used the data of a health insurance Company implemented in the Portuguese market.

2.1 OVERVIEW

2.1.1 INSURANCE DESCRIPTION

The whole life health insurance is not yet into operation in Portugal with levelled premiums.

The president of the *ISP*, Fernando Dias Nogueira, declared to the *Finantial Agency* (April 2008) that in the health domain, the major concern and priority was the implementation of the whole life health insurance for the year of 2008.

According to the *Quarterly Bulletim of PAI, 2005,* the real whole life health insurance, with exact rules about the future evolution of the premiums and the

guaranteed coverages are explored in a scarce number of markets. The whole life health insurance has in general high costs.
This kind of insurance is always related to opting out models or models that substitute the public health care systems. They are based on a funding principle that guarantee the equivalence of the premiums and the claims expected for the duration of the contact and their exploration is viabilited by the regimes of exempt contributions for the Social Security and by incentives or rules that assure a balanced mutuality of risks.

Regarding the contract conditions, there are relevant clauses that differ from a standard health insurance and have to be considered.

- Insurers restrains concerning the cancellation or coverages changes: It is a basic requisite for a whole life health insurance that once the contract is settled, the insurer cannot cancel or changes any coverage (due to a change in the health status of the policyholder or an increase in of the risk) without according it with the policyholder. Only the non-payment of the premium or any kind of fraud is acceptable.
- Policyholder's freedom concerning the cancellation or coverages changes: on the opposite of the insurer, the policyholder has the liberty to cancel the insurance contract under some specific rules (e.g. only at the end of the annuity) and penalties expressed in the General Conditions (e.g. charge for administrative costs). The change in the coverages has to be with common agreement.
- Pre-definition of the criterion of future premiums adjustment: The rules considering the adjustment of the annual premium, the annual limits, the deductibles or co-payments must be settled in the moment of the contract celebration. Most of the times these values are rated with the inflation of the health sector, the evolution of the general cost in health and other macroeconomic figures. Each insurer before the contract celebration will define these conditions.

The technical basis for the whole life health insurance are supported by the funding principle, which will allow the leveling of the annual premiums along the

entire contract, based on the principle of equivalence between the premiums and the expected future claims, pondered by income rates, inflation, mortality indexes and other variables.

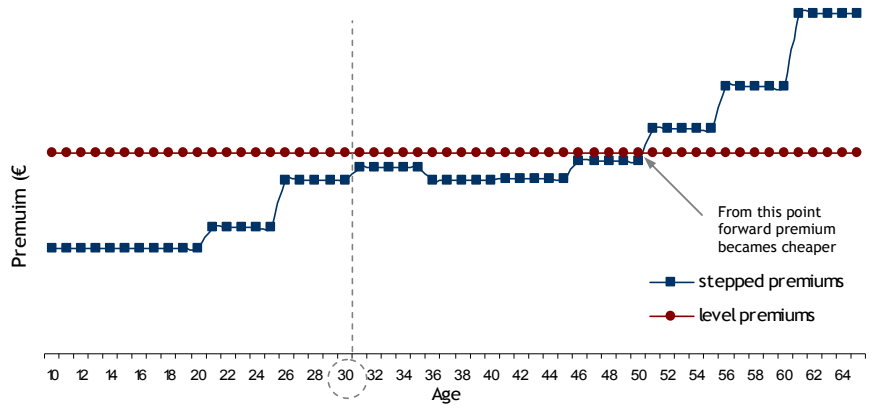
2.1.2. INSURANCE PREMIUM

In order to attain the guaranties for a whole life health insurance, once the contract is a long-term investment, the premiums rated must be levelled.

Most insurances have a rising premium policy, where the premiums increase with age. This kind of premium is named stepped premium.
In a level premiums policy, there is a fixed premium for the life of the policy, which means that the insurer quotes a premium that will remain the same (in the majority of cases) from year to year for the same level of coverages.

The level premium paid on this type of policy will be higher at the beginning of the contract but lower towards the end of its life as compared to a common policies that have rising premium rates (stepped premiums).

Figure 2.1 – Stepped versus Leveled Premiums



Source: Author's calculation

To further illustrate the savings that could potentially make over a lifetime, the previous figure shows the point in time where the cost of the level premium starts

to become cheaper than the cost of stepped premiums. This case assumes a male policyholder aged 30 years old, with a health insurance with the coverages: In Patient, Out Patient and Dental. For this person, until the age of 50 he would pay a higher premium, but after the 50, the leveled premium would be less than the stepped premiums. Therefore, while initially level premiums may be more expensive, over the long term, they are a far cheaper.

The premium is normally more than the actual claims cost of protection during the earlier years of the policy and less than the actual cost in the later years.
The building of a reserve is a natural result of level premiums. The payment in the early years, together with the interest that is to be earned, serves to balance out the underpayment of the later years.
The advantages related to the contract of a level premium cover are:

- No Premium increase
  Knowing that your premiums will not increase with age allows you to budget more easily for the future. The big advantage of a level premium is that you know in advance what the premiums will be and don't find you can't afford the cover when you need it most.

- Long –term Affordability
  Although a level premium option will cost you more initially, the total cost over the life of the policy is considerably less. This gives you certainty, and long term affordability.

- Simplicity
  With a level premium policy you are required to undergo one health check only, at the policy's inception.

This kind of insurance has a whole life guarantee, which means that the contracted conditions will be maintained until the end of life of the insured person unless in the cases mentioned in the bullet 2.1.1.

2.2 PREMIUMS CALCULATION METHOD

The next information will express the method under which this study was realised. The characteristics of the universe in study, the procedures applied to the extraction of the data and finally the calculation method for level premiums is described.

2.2.1 UNIVERSE OF THE SAMPLE

The data used in this calculation is from a health insurance Company with an historical data of ten years, which gives good statistics regarding the Portuguese health insurance market.
The universe in study corresponds to 15,8% of the total Portuguese health insured persons, and 2,5% of the Portuguese resident population. The data chosen for the calculation is only from Managed Care domain, which corresponds to 79% of the total portfolio of insurance Company mentioned.

The records concern to a universe of 269.434 insured persons with ages between zero and hundred years, being 48% Males and 52% Females.

2.2.2 INSTRUMENT AND PROCEDURES FOR THE SAMPLE COLLECTION

The instrument for the extraction of the data was the internal application software used in the insurance Company in parallel with the Access tool. The information was extracted from the central database of the Company therefore the confidence is entire.
There were made some queries to database in order to collet the desired information, Claims and Number of Insured Persons for the ten years of data available. Some filters were made in order to get only the Managed Care portfolio universe.

2.2.3 DATA ANALYSIS

For the calculation of the premiums, two fundamental factors were considered: technical interest rate and costs per insured person.

The premiums were calculated for each insured person on the basis of the risks envolved and according to the principle of equivalence. Which means that for the entire period insured, the total future premiums must be equivalent to the total future expected benefits.

The premiums calculations were made to the individual health risk, which was determined by four factors as:

I. Claim Cost per Insured Person;
II. Medical Inflation Rate;
III. Technical Interest Rate;
IV. Mortality Table;

I. Claim Cost per Insured Person

The claim cost per insured person is the basis of the premium calculation. With the historical data of the insurer it is possible to obtain an adequate amount of statistics in order to build a tariff.
To improve the credibility level of the data used, the records were divided into age groups (five to five years).

To determine the Cost for each year, the variables used were:

- Claims paid by year, age group, gender and coverage;
- Number of insured persons by year, age group, gender and coverage;

If Sy_x is the total amount of Claims Paid for an age group ***x*** in the year ***y***, Ly_x the total Insured Persons in the age group ***x*** in the year ***y*** at risk, then, the claims per age group $\underline{\mathbf{Ky_x}}$ is:

(1) $$Ky_x = \frac{Sy_x}{Ly_x}$$

In order to compare the claims per age group of the different years, all the years were updated with the medical inflation rate to the current year. Thus, as described in the previous bullet, considering i_{mir}, the medical inflation rate, for the year ***y*** the updated claims per age group for 2008 is:

(2) $$Ky_x \times (1 + i_{mir})^{(2008-y)}$$

The last very recent years of the claims paid data do not have all the total amount of claims reported yet. Which means that the year is not yet closed concerning the claims to be paid by the insurance company. This might be due to some delays in the management process of the claims, any constrain in the acceptance of the claims or the simple delay on the reporting of the claim occurrence. To make sure that the total amount of claims are considered in the calculation, it is necessary to estimate/project paid claims amount that remain to be reported later than.

Tail factor is a coefficient that determines an estimation of the claims that will still occur and/or be presented for payment.
Tail factors are used to estimate the additional development that will occur after the eldest maturity in a given loss development triangle, or after the eldest credible link ratio. (Ryan, 2005)

Tail factor takes losses from experience in the triangles to their ultimate value.
The compute for the Tail Factor involved all the historical data of the development for all years prior to 2007, and compare this aggregate

development amount to policy year 1998 losses evaluated at the end of the corresponding calendar year (2007 development/1998 losses evaluated at end of 2007, etc.). These quotients were converted into 9th report to ultimate link factors, and the average of these, after an adjustment for growth, is the tail factor.

Let $\underline{Tf_y}$ represent the tail factor to the year *y*.

Finally, with the tail factor parameter calculated for each year, the Claim cost per age group *x* for the year *y* ($\underline{Cy_x}$), comes:

(3) $$Cy_x = Ky_x \times (1 + i_{mir})^{(2008-y)} \times Tf_y$$

The result of this equation is a claim profile for that age group.

From the data available, it was selected the most recent figures since the year 2002. For each year, and for the different age groups, it was adjusted a function to each claim profiles in order to combine them and get a unique claim profile for each coverage. The adjustment of that function has varied from coverage to coverage and from segments of age groups. The majority of the cases, the adjustment made was with a polynomial function.

As the claims adjusted functions were divided by age groups, with the Interpolation methodology, it was calculated the Claim cost per Insured Person for each age.

Let the Claim cost per insured person be represented by $\underline{C_h}$.

II. Medical Inflation Rate

"The driver of the insurance premium or funding level is the claims that the insurers believes will be incurred over the approaching policy year. (…) Making projections about the level of the future experience requires the extrapolation of trends from the past into the future, and, hence, the level of medical inflation used in a pricing exercise becomes a central assumption." (*Mercer's point of view: Medical Inflation*, July 2008)

Medical inflation is a global phenomenon. Whether in private or through public system, costs are raising with demand and complexity.

The Medical Inflation is due to the increase of medical costs as well as the increase of the medical technology. Upward pressures on medical costs include a boom in the construction of health care facilities and hospitals.

Medical inflation is normally higher than the general rate of inflation.

For example, the costs in U.S. rose 8% in 2007 and will go up another 11% in 2008. In Canada, costs rose 11,5% in 2007 and will go up to 12% in 2008. In UK's costs there were up to 8% in 2007 and will maintain for 2008. France saw inflation of 6,6% in 2007 and will hit 7,3% this year. (Blankenhorm, 2008)

This study has considered the medical inflation between 2% and 3,5%. With different medical rates, it was calculated the level premium in order to attain a sensitivity analysis to this parameter.

Let The **M**edical **I**nflation **R**ate be denoted by $\underline{i_{mir}}$.

III. Technical Interest Rate

The Technical Interest Rate is very important in the premium calculation.

Technical Interest Rate is the factor that updates the costs and the premiums to a determined date. The interest rate is normally expressed as a percentage over the period of one year.

The actual interest rate is 2,322%[5].
In this study the interest rates used were between the values 2% and 3,5%. With different rates, it was made different scenarios in order to attain a sensitivity analysis.

Let denote the interest rate of the **p**aid claims as $\underline{i_p}$
And the interest rate of the **r**eceived premiums as $\underline{i_r}$.

IV. Mortality Table

In order to tariff the level premiums, and to ensure the solvency of the insurer through adequate reserves, projections must be developed of future insured events, namely death. This is done studding the incidence and severity of the events in the recent past, developing expectations about how the drivers of these past events will change over time. These events are usually in the form of tables of percentages indicating the number of death events that will occur in a population. The Mortality table shows, for a person at each age, what is probability that they die before their next birthday. The mortality tables provide the rates of mortality or death.

Considering the notation of q_x as the probability of death for a person with age x, then, 1- q_x = p_x will be the probability of survive for that person. Therefore, let $\underline{{}_{h-x}p_x}$ be the probability of a person with age x survive to age $(h-x)+x = h$.

With all the four factors that contribute to the calculation of the premium as the medical inflation rate, the claim cost per insured person, the technical interest rate and the mortality table defined; the level premium can be planned.

[5] EONIA/day,11 December, European Central Bank e REUTERS

- The Benefit paid by the insurer occurs every time the insured person requires medical assistance that is covered by the insurance policy.
  The Claims that the insurer expects to pay for an insured person with age *y* is:

(4) $$\sum_{h=y}^{w-y} C_h \times {}_{h-y}p_y \times \frac{(1+i_{mir})^{h-y}}{(1+i_p)^{h-y}}$$

With:

C_h = Claim cost per insured person/ year *h*;

${}_{h-y}p_y$ = probability of a person with age *y* survive to age *h*;

i_{mir} = Medical Inflation Rate;

i_p= interest rate associated to paid claims.

- The policyholder pays the Premium continuously, and it must be paid in an annual or monthly basis. As a result, the amount that the insurer expects to receive from the policyholder related to the total amount of premiums of an insured person with age *y*, is given by the following expression:

(5) $$\sum_{h=y}^{w-y} P_y \times {}_{h-y}p_y \times (1+i_r)^{-(h-y)}$$

With:

P_y = level premium at entry age y;

${}_{h-y}p_y$ = probability of a person with age *y* survive to age *h*;

i_r= interest rate associated to received premiums.

Regarding the age and gender of the insured person, the level premium for an insured person with age y, can be obtained through the Principle of Equivalence of level premiums by making corresponding the expressions (4) and (5),

$$\sum_{h=y}^{w-y} C_h \times {}_{h-y}p_y \times \frac{(1+i_{mir})^{h-y}}{(1+i_p)^{h-y}} = \sum_{h=y}^{w-y} P_y \times {}_{h-y}p_y \times (1+i_r)^{-(h-y)}$$

Consequently, the level premium for an insured person with age y, is the result of the following equation:

(6) $$P_y = \frac{\sum_{h=y}^{w-y} C_h \times {}_{h-y}p_y \times \frac{(1+i_{mir})^{h-y}}{(1+i_p)^{h-y}}}{\sum_{h=y}^{w-y} {}_{h-y}p_y \times (1+i_r)^{-(h-y)}}$$

Where,

C_h = Claim cost per insured person/ year h;

${}_{h-y}p_y$ = probability of a person with age y survive to age h;

i_{mir} = Medical Inflation Rate;

i_p= interest rate associated to paid claims;

P_y = level premium at entry age y;

i_r= interest rate associated to received premiums.

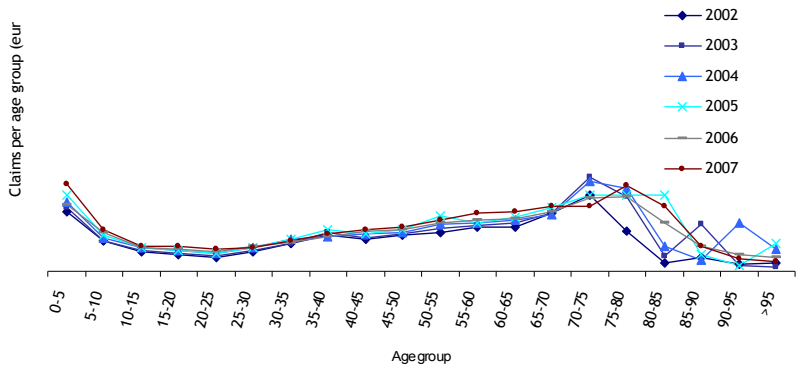
3. RESULTS

In this chapter, the results of the calculations made according to the formulas presented in the previous chapter, will be described and illustrated. In the first part of this chapter, the presentation will be related to claim costs. The second part of this section will focus in the level premiums.

3.1 CLAIM COSTS

The outcomes of the formulas presented previously, will be illustrated with an example for the In-patient and Out-patient coverages.
Regarding the calculation of the claim costs, the result of the formula (3) is, for claims profile Cy_x as the next figure shows.

Figure 3.1.1 - Claim costs per age Group for the coverage Out-Patient (male)



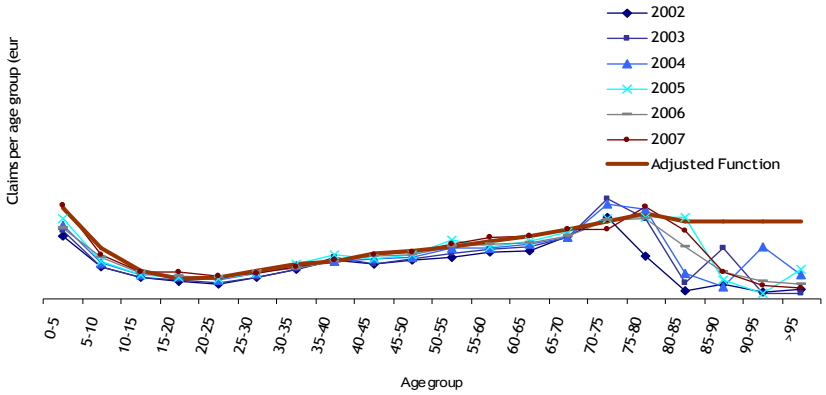
Source: Author's calculations

It is possible to verify that for the first years of life, the claim costs have a decreasing tendency until the age group 20-25 years old. From these ages forward, the claims costs increase with the age until the 80's. The claims profile is very regular along the years until the 70 years old. The number of insured people over the age of 70 years represents only 3% of the total portfolio for each year (these 3% correspond only to the group policies once the individual had a limit age of

permanence in the insurance). This fact explains the differences demonstrated in the profiles for ages above 70, once there is not enough data to get a complete credibility level. However it is likely that the number of insured persons with ages over 70 will increase in the private insurances once the insurance companies are beginning to abolish the limit age of permanence.

The consequence of the formula (3), after being made the adjustment of a function (polynomial or other), resulted in:

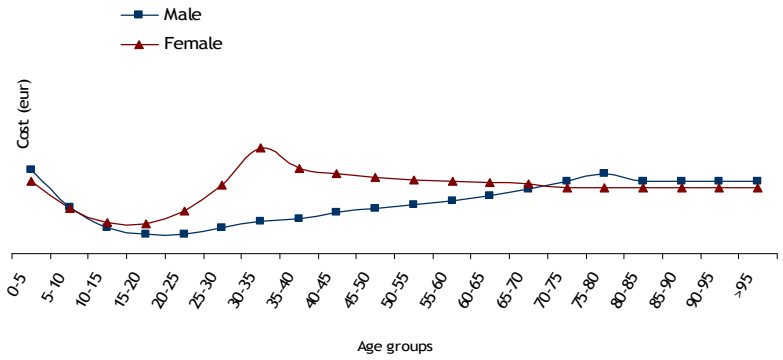
Figure 3.1.2 – Adjusted Claim costs per age Group for the coverage Out-Patient (male)



Source: Author's calculations

As the older ages are a risky segment, in this study, for these critical groups it was made an adjustment to the claim costs by levelling them by the higher expenses.

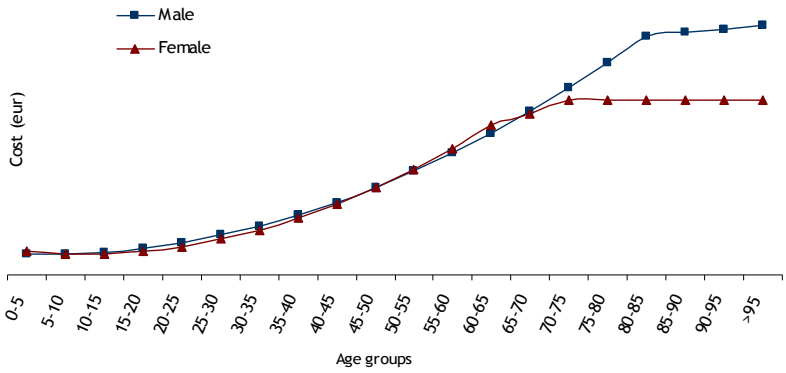
Figure 3.1.3 – Comparison of Adjusted Claim cost per age group for the coverage for Out-Patient, males and females



Source: Author's calculations

In the Out-Patient coverage, the claim costs profiles for males and females are quite different. This difference is sharped between the 20 and 40 years and the cause of this disparity is due to the claim costs related with pregnancy in females.

Figure 3.1.4 -Comparison of Adjusted Cost profile per age group for the coverage of In-Patient, males and females



Source: Author's Calculations

The figure above, illustrates the In-Patient claim costs for males and females. The profiles are fairly similar until the age of 70 years old, after this age, the male's claim costs present a significant increase. The historical data of this insurance Company has always presented higher claim costs for males in this coverage and in this segment. A justification for this increase is the fact that males do not have a continuous medical monitoring when they are young, as the profile of Out-Patient demonstrates. As a consequence, in the end of their lives, males have a tendency to be less healthy and need more In-Patient care.

3.2 PREMIUMS

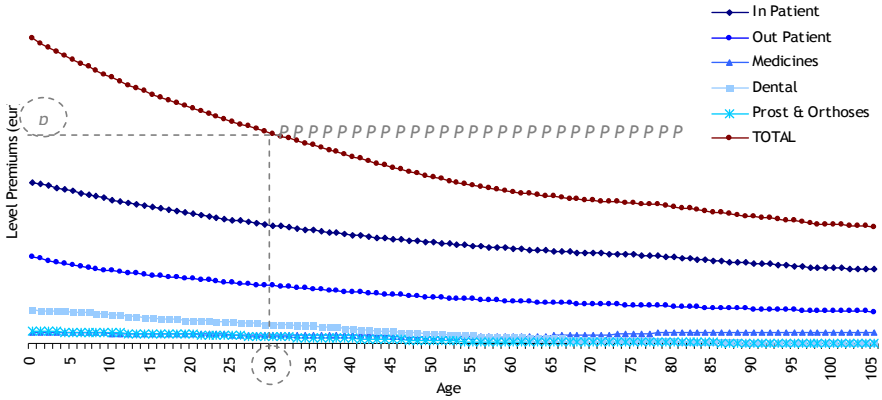
The formulas for the premiums calculations were presented in the bullet 2.2.3. The results illustrated in this section do not have into consideration any limit, co-payment or deducts and they are considering 100% of reimbursement. These premiums are pure risk premiums without commissions or fees.

For the following assumptions,

- Mortality table: TV 73/77
- i_p = 2%
- i_r=3%
- i_{mir}=3,5%

The calculation result of level premium for the males, for each coverage and for the sum of the all coverages is illustrated in the figure below.

Figure 3.1.5 – Pure Level Premium to whole life health insurance



Source: Author's Calculations

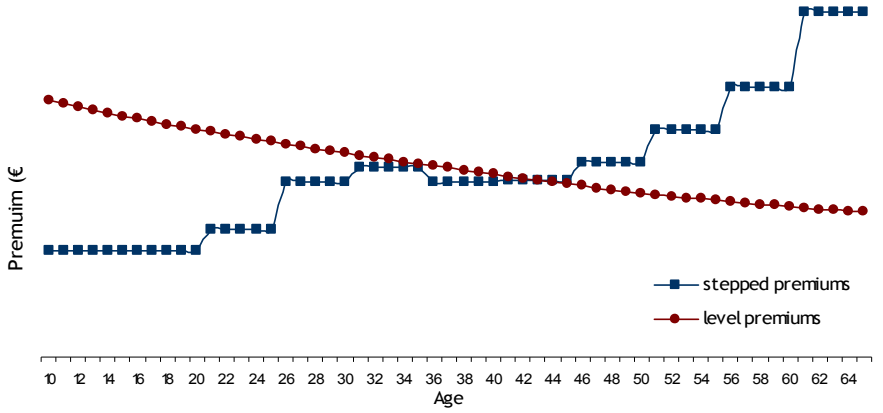
For each age of entry the level premium is draw in the figure on top. The previous chart should be read as follows, each coloured line represents the level premium for one coverage, and the dark red line is the levelled premium for the five coverages as considered.

A person aged 30 years old, who wants to apply for the whole life health insurance, must pay a level premium of ***P*** in the year of subscription and for the rest of his life.

An insured person with the age 30 years old will pay a level premium higher than an older insured person. As the claim costs increases with age, a younger person will start paying a level premium higher than his actual costs in order to constitute a provision for the moment were the premium is not enough to cover his costs.

The result of one scenario of level premiums with the same limits and coverages of a standard tariff of a common health insurance were compared and the figure below illustrates the comparison.

Figure 3.1.6 -comparison of the level premiums and the standard tariff



Source: Author's calculation, health insurance standard tariff

This figure illustrates the premium that for any entry age, the person will pay at the present moment. The difference is that, with the standard health insurance the premium will develop as the blue line along the years. With the level premium, the person starts and ends the insurance with the same premium amount. The dark red line is not the evolution of the level premiums but the levelled premium for each entry age.

The whole life health Insurance with level premiums is still an expensive insurance when people think in a short term, but if the perspective is to guarantee the future health, it is a good investment.

3.3 PREMIUM ANALYSIS

In this section, it will be explained some analysis made to the result of the premiums obtained in bullet 3.2. The purpose of this analysis was to get sensitivity to the factors that contribute to the premium calculation in order to know how is it possible to manage the factors to get a lower premium, or which factors leads to higher premiums also.

As it was mentioned previously, the calculation of the premium was determined by several factors, these factors are related to the market conditions and to medical development, so they can vary with external conditions of the insurer and return an impact in the premium.

The medical inflation rate, the interest rate of the paid claims and the interest rate of the received premiums are variables that influence the level premium.
In order to get a thought of how each of these technical factors manipulates the premiums, it was made a sensitivity analysis and the following results were obtained:

Table 3.1 - Effect in the premium by the change in the technical factors

Increase in the Factor	Effect in the Level Premium
i_p	Decrease
i_r	Increase
i_{mir}	Increase

The performance of the increase of the rates has different effects in the level premium. An increase of the interest rate of the paid claims (i_p) leads to a decrease of the premium, for the other two rates, the opposite occurs. However, when increasing the same amount in the interest rate of the received premiums (i_r) and the medical inflation rate (i_{mir}), the level premium is higher with the increase of the medical inflation rate.

For the same mortality table, and for three different rate percentages (2%, 3% and 3,5%), it was made all the combinations for i_p, i_r and i_{mir} to know how the different factors interfere together in the premium.

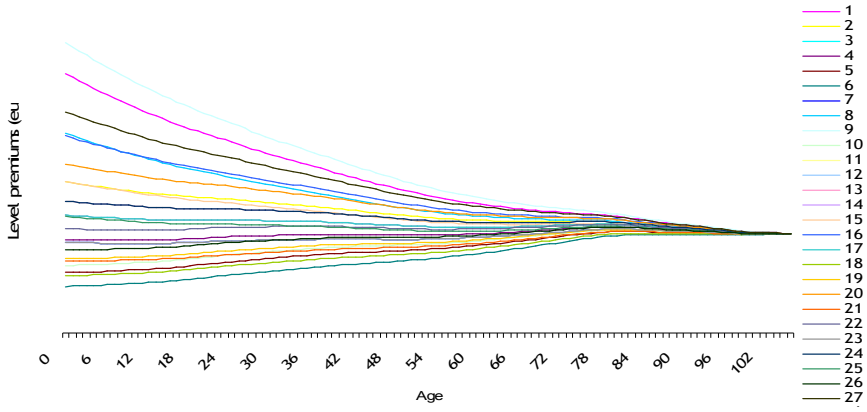
The table below present the total combinations of the rates; furthermore, the next figure shows graphically the level premiums as a result of the different scenarios.

Table 3.2 – Scenarios for different rates

Mortality table: TV 73/77

scenario	i_p	i_r	i_{mir}	scenario	i_p	i_r	i_{mir}
1	2,0%	3,0%	3,5%	15	2,0%	2,0%	3,0%
2	3,0%	3,0%	3,5%	16	2,0%	3,0%	3,0%
3	3,5%	3,0%	3,5%	17	3,0%	3,0%	3,0%
4	3,5%	3,0%	3,0%	18	3,0%	2,0%	2,0%
5	3,5%	3,0%	2,0%	19	3,0%	3,0%	2,0%
6	3,5%	2,0%	2,0%	20	3,0%	3,5%	3,5%
7	3,0%	2,0%	3,0%	21	3,5%	2,0%	3,0%
8	2,0%	2,0%	3,5%	22	3,5%	3,5%	3,0%
9	2,0%	3,5%	3,5%	23	3,5%	2,0%	3,5%
10	3,5%	3,5%	2,0%	24	3,5%	3,5%	3,5%
11	3,0%	3,5%	3,0%	25	3,0%	2,0%	3,5%
12	2,0%	2,0%	2,0%	26	3,0%	3,5%	2,0%
13	2,0%	3,0%	2,0%	27	2,0%	3,5%	3,0%
14	2,0%	3,5%	2,0%				

Figure 3.1.7 –Total Level premium for different rates



Source: Author's calculation

As the figure illustrates, the impact of the different rates is significant. The best scenario - 6 (with the lower level premiums) is the one with i_p=3,5%, i_r=2,0% and

i_{mir}=2,0%. The worse scenario - 9 (with the higher level premiums) is the one with i_p=2,0%, i_r=3,5% and i_{mir}=3,5%.

In order to find out which of the previous scenarios were similar, it was made a cluster analysis. "Cluster analysis is more primitive technique in that no assumptions are made concerning the number of groups or the group structure. Grouping is done on the basis of similarities or distances." (Johnson R. A. and Wichern D. W., 1992)
The procedure adopted in order to group, was the distance. For all the 27 scenarios, it was calculated the squared Euclidian distance between every two scenarios. As the following example demonstrates;

Let scenario 1 be denoted by C1 and scenario 2 by C2, then C1=[$c1_0$, $c1_1$, $c1_2$, …$c1_{105}$]' where $c1_0$ represents the level premium for the age 0 and with C2 =[$c2_0$, $c2_1$, $c2_2$, …$c2_{105}$]', the Euclian distance between both scenarios is:

Comentário [BP1]:

$$d(C1,C2)=\sqrt{(c1_0-c2_0)^2+(c1_1-c2_1)^2+\ldots+(c1_{105}-c2_{105})^2}=\sqrt{(C1-C2)'(C1-C2)}$$

Consequently, it was calculated the squared distance between scenarios as:

$$\sum_{j=0}^{105}(c1_j-c2_j)^2$$

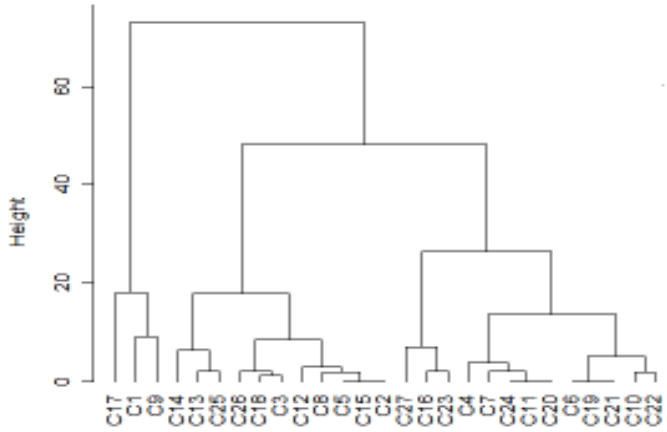
These distances were computed in *R* program (version R 2.7.1) in order to verify graphically which scenario was related with another. The three methods were chosen for the display of the dendogram: the single linkage, the complete linkage and the average linkage for the distances between 27 scenarios.

The inputs for the Single Linkage algorithm were the distances between pairs of scenarios. In this method, groups are formed from the individual entities by merging nearest neighbours, where the term nearest neighbour connotes smallest distance. Initially, it is found the smallest distance in D={d_{ik}} and merge the corresponding objects to get the cluster.

The Complete Linkage clustering proceeds in much the same manner as single linkage, with one important exception. At each stage, the distance between clusters is determined by the distance between the two elements, one from each cluster, that are most distance. Thus complete linkage ensures that all items in a cluster are within some maximum distance of each other.
The average linkage treats the distance between two clusters as the average distance between all pairs of items where one member of a pair belongs to each cluster.

As an example, the figure below illustrates the result of the complete linkage method.

Figure 3.1.8 – Cluster Dendogram



Source: Author's calculation

The dendogram shows the hierarchical clustering, the groupings and the distance levels at which they occur.
It can be observed that some scenarios as (C5,C15,C2) , (C24,C11,C20) and (C6, C19, C21) cluster at first level. The scenario C17 remain by them self until an intermediate level, which means that for i_p=3,0%, i_r=3,0% and i_{mir}=3,0% the *R* program with the complete linkage method, consider that the premium achieved with this scenario is not clustering with any other premium in an immediate level.

4. CONCLUSION

Health makes part of everybody's life and is something that everyone is concerned about; therefore it is a current item to be discussed.

In the first section of this document it was made a general overview about the Portuguese health system.
The Portuguese health care system has three structures: the public *NHS*, Special public and private insurance programmes and the private health insurance schemes. Considering the public organization, the *NHS* has been restructured in order to improve performance. The level of demand of the Portuguese citizens have increased, they want more and better access and quality to health care. Consequently, beside the improvements of the *NHS*, the private health sector activity continues to prosper in a fast way. At the present time, around 22% of the Portuguese population is covered by a private health insurance.

The health insurance is a potential market to the insurers once, is not only the individual segment who looks for this product, but also employers who offer their employees this insurance as an extra-salary and also reap from fiscal incentives.
The main conclusion of the first section is that Private health care providers mainly fulfil a supplementary role to the *NHS* rather than providing a global alternative to it.

Besides the increase and diversity in the offer of private health insurances, there is still a gap in the available health insurance products. The insufficiency has to do with the age limit that some insurers establish or the absence of products to elder ages. Ageing is a consequence of many developed countries that poses series challenges for the health systems and for the economy generally. Particularly, in Portugal, ageing is also a reality, the ageing index has reached 113,6% in 2007.
Therefore, a health Insurance with whole life guarantee is presently a priority demand.

In the second part of this dissertation it was described the characteristics of the whole life health insurance and it was presented an approach to the level premium

calculation. The health insurance premium was calculated for each insured person on the basis of the risks involved and according to the principle of equivalence. This means that over the entire period insured the total of the premiums should match the total of benefits.
For the calculation of level premiums, the following factors were of fundamental importance: claim cost per insured person, medical inflation rate, technical interest rate and the mortality table.

The third section of this study presented the results achieved from the calculations of the level premiums. An important finding is that under uncertainly factors as interest rate and medical inflation rate the level premiums present considerable changes. The interest rate impacts in the level premium with an inverse proportion, the higher the interest rate, the lower the level premium.
Another remark that can be taken from the results is that the level premiums for the whole life health insurance can be expensive when one thinks in a short term, but satisfactory regarding the long-term period.

This work suggests several promising areas of future research.
First, the data used in this study, had detailed health information but limited in terms of statistics for ages over 70 years old. Thus calculations may be more accurate if new data source is available.
Second, the analysis of the level premiums has been limited to the calculation of the premium itself without taking into account some other important factors as the lapsation of the insured persons. It would be useful to extend the analysis with more sensitivity factors as lapsation and also consider the premium adjustment as a repricing when there are changes in the technical basis.
Ultimately, the level premiums have the particularity of being higher than the claim costs of the insurer person for younger ages and lower in the older ages. This inverse proportion leads to a safety measure named reserves. The reserves were not mentioned in this study despite their huge importance.

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CEA (www.cea.assurg.org)

INE (www.ine.pt)

ISP (www.isp.pt)

OECD (www.oecd.org)

PAI(www.apseguradores.pt)

Site Alto Comissariado da Saúde (http://www.acs.min-saude.pt/acs)

Site Ministério da Saúde (www.portaldasaude.pt)

APPENDIX

Programming Code – *R* aplication

```
#Leitura dos Dados
Premios<-read.table("PremiosMasc.txt", header=TRUE, sep="\t",dec=".")

op <- par(ask=TRUE)

#Atribuição de nomes para as idades e para os cenários
Idades<-array(names(Premios[,2:107]))
Cenarios<-array(levels(Premios[,1]))

#Tornar os valores mais pequenos
Premios[,2:107]<-Premios[,2:107]/100

#Tratamento e classificação dos cenários
#Cálculo das matriz de distâncias euclideanas (distâncias entre cenários)
euc<-dist(Premios[,2:107],method="euclidean")

#Classificação dos ceários segundo três métodos

#Método single clustering
clusing<-hclust(euc,method="single")
plot(clusing,labels=Cenarios,hang=-1)

#Método complete clustering
clucomp<-hclust(euc,method="complete")
plot(clucomp,labels=Cenarios,hang=-1)

#Método average clustering
cluaver<-hclust(euc,method="average")
plot(cluaver,labels=Cenarios,hang=-1)
```